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October, 1955 Vol. 6, No. 4

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NEWS AND VIEWS

In consequence of the hard work put in by **Mr. R. D. Weal** we are enabled to publish the Index for the current year with this number. Binding of volume 6 can be undertaken immediately and the cost, including postage and packing, is 10s. Please send all volumes for binding direct to the Editor.

May we also remind subscribers that subscriptions for 1956 are due NOW.

We are always grateful for all subscriptions sent in early and without the need of a reminder as this wastes a good deal of time and money which could otherwise be spent on the improvement of the *Gazette*. The subscripion remains at 20s., which is the lowest subscription rate for any entomological journal in this country—prompt payment of subscriptions will help us to keep it so.

The **Commonwealth Institute of Entomology** has moved from the accommodation it occupied in the building of **The Royal Entomological Society of London**, and is now at 56 Queen's Gate, London, S.W.7, from which address **The Review of Applied Entomology** and **Bulletin of Entomological Research** will in future be published.

We have the greatest pleasure in welcoming to our Editorial Panel **Dr. E. A. Cockayne, O.B.E., F.R.E.S.**

Dr. Cockayne needs no introduction; his wonderful work in every field concerning the British Macrolepidoptera is known all over the world and we consider ourselves fortunate that he has accepted our invitation to join the Panel.

NOTES AND OBSERVATIONS

IN THE LIGHT OF MODERN KNOWLEDGE . . . . !

Friday, 19th November, 1954. *Times Parliamentary Report.*

So much happened soon after 19th November, 1954, that there is a great danger that a question asked in Parliament will be buried in *Hansard* and lost to entomologists.

"Mr. Tom Brown, Ince, Labour, said that the Minister should say what he was going to do to deal with a terrible insect known as the wood hornet. Often it was already in pit props from Finland or Northern Russia, and was so small that it could not be seen. Once a wood hornet got on the back of a miner, who thought it was only a speck of dirt, it bored into his back and set up septic poisoning."

The first paragraph appears to refer to *Sirex gigas* L., which has been established in this country with its parasite for many years, but is constantly being imported afresh in pit props, but the next paragraph shows that Mr. Brown is not referring to *Sirex gigas,* but to some insect which I have been quite unable to identify. Why does he call an insect no bigger than a speck of dirt a wood hornet? Everyone knows that a hornet is a large and alarming creature.

I hope Mr. Tom Brown was successful at the general election and that we shall be treated to some more gems of entomological knowledge.

E. A. COCKAYNE.

8 High Street,
Tring, Herts.

DISTRIBUTION OF *ARANEUS INCONSPICUUS* (SIMON)

G. H. Lockett and A. F. Millidge (1951-53, *British Spiders,* **2**: 148) list this uncommon species from the New Forest, Hants., Surrey, Bucks. and Middlesex. I am now able to extend its distribution to the West and the Midlands. The New Forest locality is given by Bristowe (1939-41 *The Comity of Spiders* **1**: 55) as in Dorset ('Glanvilles Wootton'). Mr. J. Cowley collected a ♂ at Compton Dundon, N. Somerset on the 4th June this year, and I swept a ♀ from under oak on the Wrekin, Shropshire, on the 16th May, 1954. Comparison of these specimens with others collected at Bookham, Surrey, on Lawson's cypress in March, 1953, indicate the absence of the posterior lateral black spots on the abdomen (referred to in *British Spiders*) to be fairly constant, and with caution may be used as a character to separate *inconspicuus* in the field from the closely related *A. cucurbitinus* Clerk and *A. alpicus* (L. Koch).

A. E. LE GROS.

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Wellington, Shropshire

THE IMMATURE STAGES OF THE EMPEROR DRAGONFLY, *ANAX IMPERATOR* LEACH (ODONATA: AESHNIDAE)

By PHILIP S. CORBET
(Department of Zoology, University of Cambridge)

Introduction

The Emperor Dragonfly is exceptional amongst British Odonata in that it can be identified by eye in all its stages. It is therefore of particular value as a subject for ecological study.

Several descriptions of the immature stages already exist to which reference will be made in appropriate sections of the following account. It is considered, however, that none is sufficiently comprehensive to provide a system for reliable identification, and it is the purpose of this paper to fulfil this requirement, at the same time describing certain developmental features of comparative interest.

Material and Methods

On 10th June, 1950, at a small pond in Berkshire, about thirty eggs were obtained from a leaf of *Potamogeton natans* L. in which a female of this species had just been observed to oviposit. The leaf containing the eggs was kept in a well-illuminated room, shaded from direct sunlight, at an average temperature of about 15-20 deg. Centigrade.

The first larvae hatched between 8th-10th July and the last (thirty-first) larva on 1st August, 1950. After hatching, larvae were removed from the stock dish containing the eggs and placed each in a separate container. Only three larvae survived instar 3; of these, one died in instar 5 (1st October) and the other two in the antepenultimate instar, which represented instars 13 and 14 respectively. The dates of ecdyses during the growth of these two larvae are given in Table I.

Up to, and including, the antepenultimate instar, morphological data are derived mainly from these two larvae. Descriptions of the penultimate and final instars are based on larvae and exuviae collected from the habitat which provided the eggs. Data concerning colour change are also derived from field material.

It is likely that the number of instars varies considerably (*vide* Robert, 1939); therefore dimension is not likely to be a useful criterion for identification of instars, especially the intermediate ones. In Table II measurements are provided only as an indication of approximate size. Head-widths are given to the nearest 0.05 mm., and represent means between the two larvae measured. Body-lengths given represent the distance from the anterior margin of the head to the distal tips of the paraprocts. This dimension is variable within an instar depending upon the degree of abdominal expansion (see

TABLE I.

Dates of ecdyses of two reared larvae.

Instar.	Date of entry to instar.	
	Larva (1).	Larva (2).
2	17 July, 1950.	19 July, 1950.
3	25 July.	28 July.
4	15 August.	8 August.
5	2 September.	17 August.
6	15 September.	1 September.
7	5 October.	14 September.
8	21 October.	6 October.
9	3 November.	25 October.
10	19 November.	6 November.
11	8 December.	22 November.
12	1 January, 1951.	8 December.
13	26 January.	30 December.
14	16 March.	—
Died, in antepenultimate instar.	25 April.	8 January, 1951.

Fig. 22), but is nevertheless of great use in the interpretation of field samples. The measurements in Table II are given to the nearest ½ mm., and were taken from living material. With the exception of the last two instars, head-widths were derived from exuviae, by doubling the distance from the outer margin of the compound eye to the ecdysial suture. Exuviae were also used for descriptions of the antennae, labium and tarsi.

The two larvae reared to the antepenultimate instar were kept indoors without artificial heating until 1st October; after this they remained in a centrally-heated room. Protozoa and Cladocera were provided as food in the early instars; from about instar 5 onwards, larvae fed principally upon small Oligochaeta (Enchytraeidae), although, on occasion, it was possible to vary the diet by providing larvae of Chironomidae and Zygoptera, and small, terrestrial Lumbricidae.

The egg

The egg (Figs. 1-3) has been figured by Lucas (1900) and Robert (1939). A character which distinguishes it from the eggs of all other

British Odonata so far studied is the blade-like projection extending beyond the anterior pole (Fig. 1, a). In *A. imperator* this was first figured by Robert; it is absent from Lucas's drawing, possibly because he may have used unlaid eggs obtained by dissection. A similar structure has been discerned in the egg of *Anax junius* (Drury) by Needham & Betten (1901) and probably in *A. papuensis* Burm. by Tillyard (1917). Calvert's failure to notice it in *A. junius* (1934) may perhaps be ascribed to the desiccated condition of his material. Robert mentions this cone as being a feature also of the egg of *A. parthenope* Selys, and it has been found recently in the egg of *Hemianax ephippiger* (Burm.) (Gambles, 1954). It is probably justified to regard it as being present throughout the genus *Anax*.

Robert remarked that this blade-like structure was actually a truncated, open cone, with its base enveloping the egg and its apex free. Bearing in mind that the eggs of *A. imperator* are somewhat exceptional amongst the Aeshnidae in that they hatch before decomposition of the plant tissue containing them, Robert suggested that this cone served either as a sheath through which the hatching larva could pass at the time of eclosion, or else as a blade preventing imprisonment of the enclosed egg by overgrowth of the surrounding plant tissue. The state of the cone immediately after eclosion (Fig. 2) demonstrates its use as a passage by the emerging larva. The status of its function in preventing imprisonment of the egg requires further investigation, since this structure has not been discerned in the eggs of all Zygoptera having similar ecological demands.* Its function may sometimes be one of anchorage; for, when eggs are laid through the top of a *Potamogeton natans* leaf, they project below the lower surface to such an extent that only the cone holds them in position.

Larval development

The first larval instar, or pronymph, has been described by Robert; it lasts only a few seconds. Both Portmann (1921) and Robert have figured the instar 2 larva. This stage is shown in Fig. 4, whilst the 3rd, 5th and final instars form the subjects of Figs. 5, 9 and 10, respectively. The external morphological changes associated with larval development are described below under the appropriate headings. The principal larval characters are itemised in Table II.

Antennae

In instar 1 the antennae are imperfectly segmented (Fig. 3). They consist of three segments in instar 2. By the time that instar 12 has been reached, the antennae possess the final complement of seven segments. Until the six-segmented condition, additional segments arise by division of the proximal segment of the flagellum. The final

* *Coenagrion hastulatum* (Charp.) and *C. puella* (L.) are perhaps exceptions: in these species a funnel-shaped, membranous sheath encloses the anterior pole of the egg (Gardner, 1954).

TABLE II

Summary of Characters of Larvae

Instar	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Penult	Final
Antennal segments		3 (16)	3 (8)	4 (2)	4 (2)	4	4 5	5 (2)	5 (2)	5 6	6 7	7 (2)	7 (2)	7	7	7
Tarsal segments		1 (16)	2 (8)	2 (2)	2 (2)	2 (2)	2 (2)	2 (2)	3 (2)	3 (2)	3 (2)	3 (2)	3 (2)	3	3	3
Abdominal segments covered by wing-sheaths		—	—	—	—	—	—	—	—	—	—	½	¾	1	2¼	4¼
Anal cerci		—	—	—	—	—	x	x	x	x	x	x	x	x	x	x
Gonapophyses		—	—	—	—	—	x	x	x	x	x	x	x	x	x	x
Head-width (mm.)		0.85	1.10	1.35	1.50	1.75	2.10	2.55	3.05	3.65	4.40	5.50	6.25	7.20	8.10	9.00
Body-length (mm.)		2	3	4	5	6	7½	9	11	15	20½	26	31	35	40	50
Percent. banded		—	100	100	97	95	83	70	53	9	—	—	—	—	—	—

NOTE:—When the frequency of an observation exceeds one, it has been recorded in parentheses.

division, which occurs between instars 10 and 11, or 11 and 12, involves the apical segment of the flagellum. It is interesting to note that this pattern of segmentation resembles exactly that recorded for *A. junius* (Calvert, 1934), *Aeshna mixta* Latreille (Gardner, 1950), *Coenagrion hastulatum* (Charp.) (Gardner, 1954) and *C. mercuriale* (Charp.) (Corbet, 1955), but differs from that observed for *Lestes, Libellula, Leucorrhinia* and *Sympetrum* (Gardner: various papers, 1950 *et seq.*).

Labium

Terms used to describe the labium have been defined elsewhere (Corbet, 1953).

In view of the transitory nature of instar 1, the pronymphal labium is best inspected before hatching (Fig. 3). At this stage its shape closely resembles the corresponding organ of *A. junius* (Butler, 1904). Although sharing with *Sympetrum striolatum* (Charp.) the deeply-cleft prementum (Corbet, 1951), the differences between the two species in the shape of the palpi foreshadow the fundamental characters of Libellulid and Aeshnid labia.

From instar 2 onwards, the labium remains of the same general shape (Figs. 11 and 12), but changes occur in the conformation of the distal margin of the median lobe and of the distal and inner margins of the palpi.

Median lobe

The median cleft remains a distinct feature throughout development (Figs. 13 to 17). On either side of it, in instar 2, lie six poorly-delimited spines. The outermost spine off each side is associated with a robust seta which can be recognised until instar 7. Other, smaller setae lie slightly posterior to the distal margin, but it is difficult to recognise any system in their arrangement or to determine which, if any, corresponds to the second seta expected from observations upon instar 2 labia of other Odonata. In instar 3 a series of small, simple setae develops along the dorsal surface of the distal margin, each seta being associated with a tooth-like spine. These setae increase in number during development, but do not provide the main armature of the distal margin as in the Coenagriidae and Libellulidae. This is done by the densely-packed piliform setae which are a common feature of the labia of the Aeshnidae and Gomphidae. These piliform setae are inserted on the ventral surface of the distal margin, and their rudiments can be discerned first in instar 5, when six pairs of setae arise on each side of the median cleft (Fig. 15). A feature of interest is that members of a pair apparently spring from a single socket. This observation continues to hold good until the setae become so numerous that their individual origins can no longer be resolved. Thus it may be that piliform setae are produced by the division of a single setal element. In instars

6, 7, 8 and 9, respectively, there are about nine, thirteen, twenty and thirty-five pairs of piliform setae on each side of the median cleft. After instar 9 they become too numerous to count.

Palpus

The palpi of the 2nd, 7th and final instars are shown in Figs. 18, 19 and 20. That of instar 2 possesses a single, short, robust seta proximal to the insertion of the movable hook. A seta placed similarly has been observed in *A. junius* (Calvert, 1934) and *Aeshna mixta* (Gardner, 1950). It is tempting to regard this as representing the homologue of the primary palpal seta which is a feature of the instar 2 palpus of many Coenagriidae and Libellulidae.

The palpal seta of instar 2 moves towards the outer margin and is joined by another of the same size in instar 3 (see Fig. 19). This finding corresponds to Calvert's observations for *A. junius,* although, in this respect, he differed from Butler who figured two such setae for the palpus of instar 2. In *A. imperator* these two setae remain throughout development, although, after instar 10, they are so minute as to be almost invisible, their identity being recognizable only by reference to previous instars.

In instar 2, the distal margin bears three very small setae which may well be homologous with those observed in *S. striolatum* at the same stage (Corbet, 1951). These increase in number as development proceeds, as do similar setae which arise along the inner margin in instar 3. The principal trends during growth of the palpus are towards smoothing of the dentations on the distal margin of instar 2, development of serrations along the inner margin, and enlargement and reinforcement of the end hook.

Anal cerci

These appear first in instar 7 and, from instar 8 onwards, increase in size.

Wing-sheaths

Pleural ridges on the meso- and metathorax can be recognized first in instar 6. Two raised points appear on the ridges in instar 7 and, from instar 8 onwards, their size increases rapidly.

The number of abdominal segments covered by the wing-sheaths provides a useful character for identification of the last three larval instars (see Table II). More than 70 larvae have been reared through the penultimate and final instars, and more than 10,000 final instar exuviae collected in the field; yet amongst this material there was only one larva which did not conform to the classification given in Table II. This showed a stage in wing-sheath development intermediate between those typical for the last two instars, and it died in the process of metamorphosis.

Head

The increase in head-width at each ecdysis is extremely variable, but usually lies between 10 per cent. and 30 per cent.

The dorsal outline of the head changes considerably during development (*cf.* Figs. 4 and 10). In instar 2 the eyes are directed anterolaterally, thus resembling larvae of the genus *Aeshna.* Subsequently, the eyes extend progressively posteriorly, and impart to the head the almost circular outline that is so characteristic of *Anax* larvae. After instar 2, the shape of the head provides a means whereby *A. imperator* can be distinguished immediately in the field from any species of *Aeshna* (Gardner, 1953).

In the instar 2 larva, the frontal region of the head projects anterodorsally in the form of a blunt horn; this is smooth and naked save for fine, black hairs scattered around the apex (Fig. 8). The head of the instar 2 larva of *A. junius* appears similar in this respect (Calvert, 1934). In instar 3 this horn is no longer present (Fig. 7). Its presence in instar 2 may be a reflection of the hyperdeveloped frontal region of instar 1, a morphological feature which may be associated with eclosion.

Colour pattern

The distribution of dark pigment in instar 2 (Fig. 4) is diagnostic of this species when compared with other British Aeshnids (Gardner, 1953). The dark areas are almost black.

Larval colour pattern changes markedly during development. The instar 3 larva is striped transversely with broad white bands (Fig. 5). The distribution of the white bands shows very little variation, and banded larvae provide an abrupt contrast to homogeneously-coloured forms. The presence of such a colour pattern in young larvae of the genus *Anax* has been known for many years, and has been commented upon by several authors (Needham & Betten, 1901; Tillyard, 1916; Portmann, 1921; Calvert, 1934, and Münchberg, 1932).

During development the banded pattern is gradually replaced by the greenish, mottled coloration of the older larva. The transition is indicated first by appearance of mottling in the dark areas, and later by reduction in extent of the white bands. A larva in the process of losing the banded pattern (instar 5) is illustrated in Fig. 9. That banding is a juvenile character is demonstrated in Fig. 21, which shows the number of banded larvae of a given length expressed as a percentage of the total larvae collected from a single habitat over a period of three years. This diagram can be used as an approximate guide to the incidence of banding to be expected amongst larvae of a given length.

After having lost the banded pattern, larvae are usually ochreous brown (more often in summer), olivaceous or green. In the laboratory it is possible to make them almost completely black or white, respectively, by providing the appropriate background. By such means larvae can be made to lose the banded pattern sooner than they

would have done in the field. It is hoped to discuss the ecological significance of this juvenile character elsewhere.

The colour pattern of the final instar larva is shown in Fig. 10. The principal features of diagnostic value to which attention may be drawn are the longitudinal, dorsal, pale stripes on the pro- and mesothorax; the oblique, latero-dorsal, pale stripes on abdominal segments 5 to 8; and the dorsal, black puncta on these segments. The dorsal puncta are similar in position to those illustrated for *A. junius* by Calvert.

During most of the final instar the ground colour is an olivaceous brown, although shortly after ecdysis it may be mainly green.

Identification characters

In Britain, where no other members of the genus *Anax* are to be found, the egg may be distinguished from all other Odonata so far inspected by the blade-like cone covering the anterior pole.

After instar 2, in which the colour pattern is distinctive, the larva can be recognized by the rounded shape of the head, and by the colour pattern, whether it is banded or not.

Characters which may be useful to check identification are: the shape of the prementum of the labium; the presence, in all larval instars, of lateral spines on abdominal segments 7 to 9; and the length of the body in the final instar (see Fig. 22).

Summary

1. *A. imperator* has been reared from egg to antepenultimate larval instar.

2. The principal changes in external morphology that take place during development are described.

3. Attention is drawn to characters that can be used to identify the several stages.

Acknowledgments

I am indebted to Mr. W. Rogers for his care of reared material during my absence in July, 1950. I wish to thank Professor V. B. Wigglesworth and Mr. A. E. Gardner for reading and criticising the typescript. I am grateful to the Department of Scientific and Industrial Research for financial assistance while this work was in progress.

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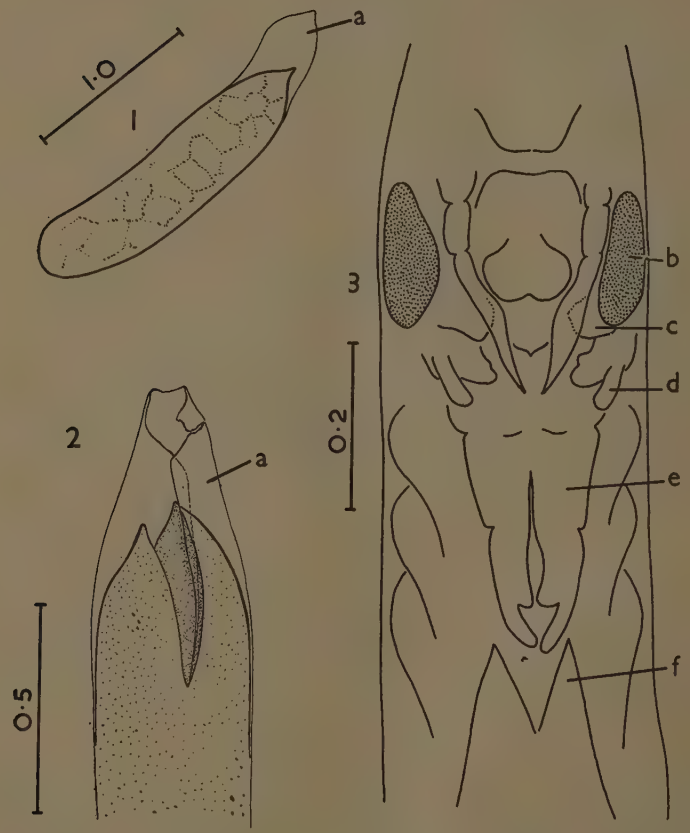

Figs. 1-3: (1) Egg, 13 days after laying. (2) Egg: anterior region showing condition of terminal cone after eclosion. (3) Part of ventral surface of embryo lying within egg (26 days after being laid, 4 before hatching) showing form of mouthparts. *a*, anterior cone; *b*, compound eye; *c*, mandible; *d*, maxillary palpus; *e*, prementum of labium; *f*, left paraproct. All measurements are given in millimetres.

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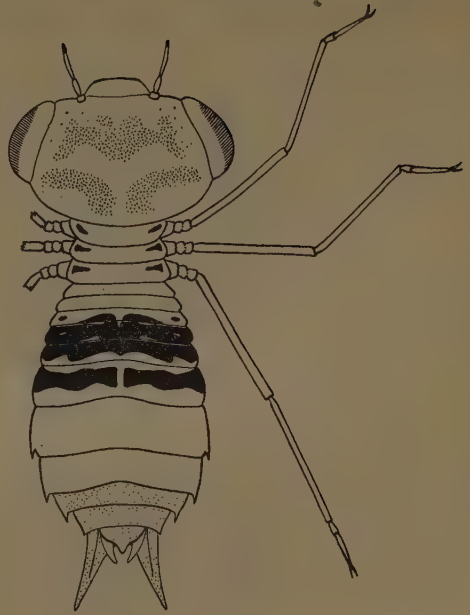

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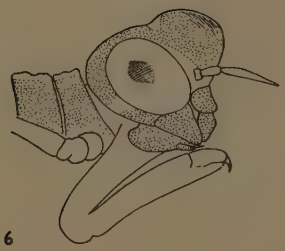
Figs. 4 and 5: (4) Instar 2 larva. (5) Instar 3 larva, showing the juvenile banded coloration.



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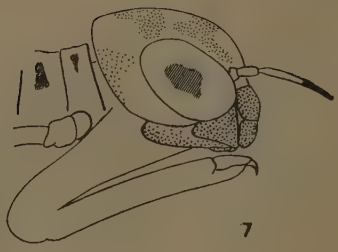
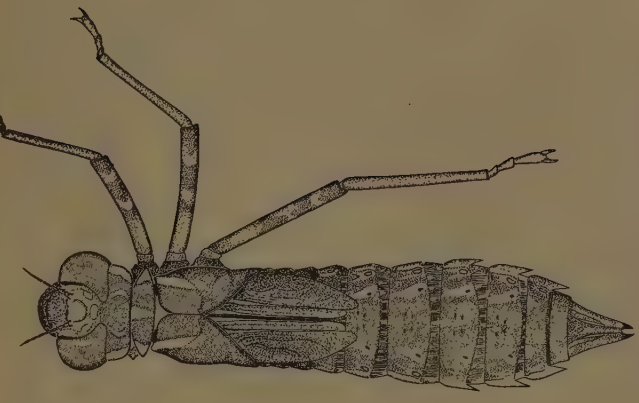
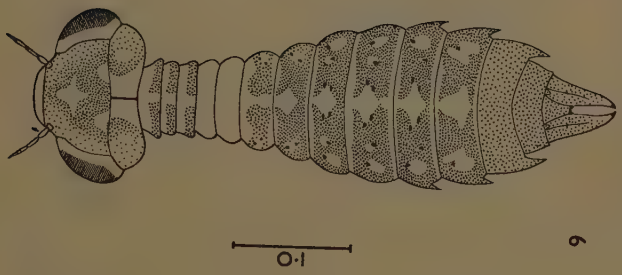


7

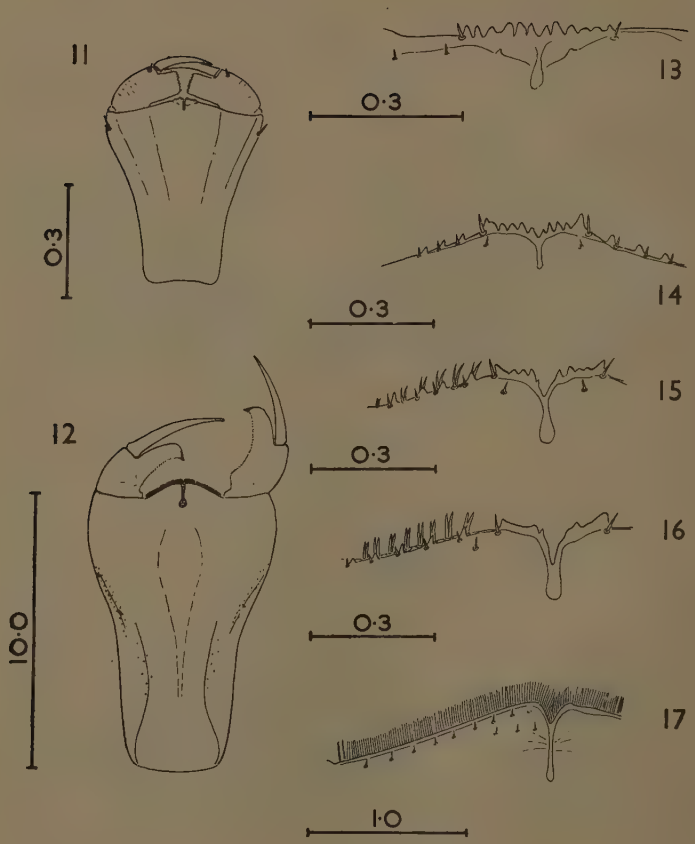
8

Figs. 6-8: (6) Instar 2: head from right side to show frontal horn. (7) Instar 3: head from right side. (8) Instar 2: head from front.

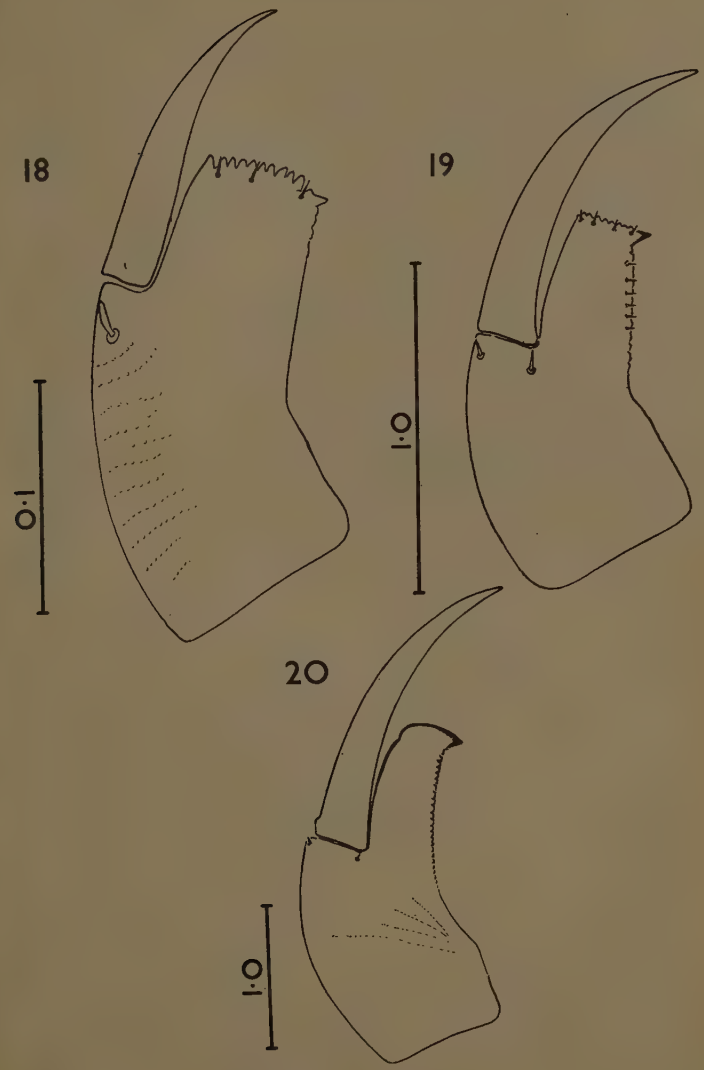




Figs 9 and 10: (9) Instar 5 larva, in the process of losing the juvenile banded coloration. (10) Final instar larva.



Figs. 11-17: (11) Labium of instar 2. (12) Labium of final instar. (13) to (17) Part of distal margin of median lobe. (13) Instar 2. (14) Instar 3. (15) Instar 3. (16) Instar 6. (17) Final instar.



Figs. 18-20: Left labial palpus. (18) Instar 2. (19) Instar 7. (20) Final instar.

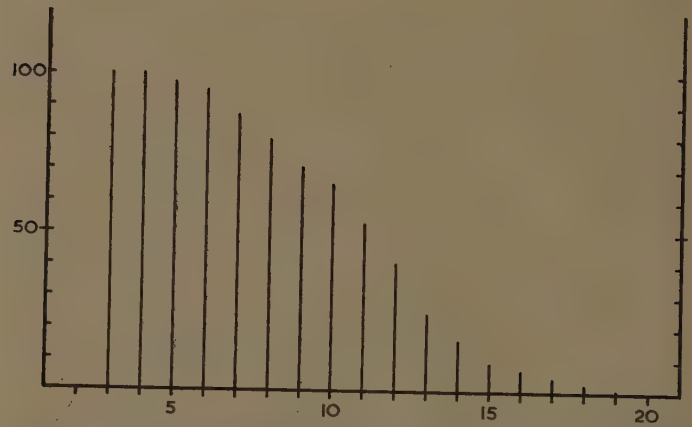


Fig. 21: Diagram to show loss of banded coloration with age. *Abscissa*: length of larvae in millimetres. *Ordinate*: per cent. of total larvae at a given length that showed complete banding, smoothed by a moving average of 3. Data from field collections from one habitat during the period 1950-53.

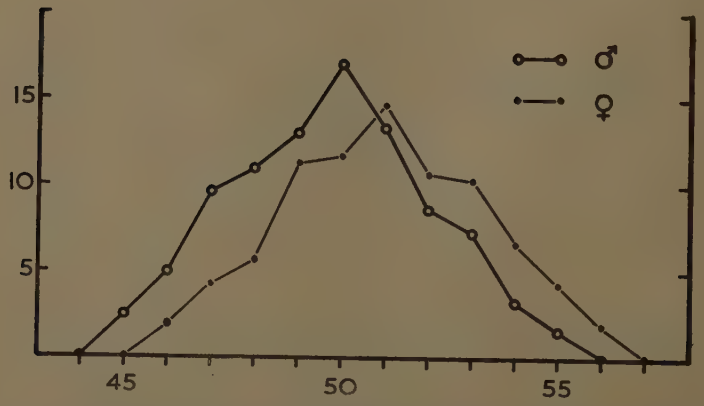


Fig. 22: Range of variation in body-length of final instar larvae. *Abscissa*: length in millimetres. *Ordinate*: frequency, smoothed by a moving average of 5. Data from field collections from one habitat during the period 1950-53.

CECIDOMYIDAE (DIPT.) FROM NORFOLK—I.

By S. A. MANNING, F.L.S., F.R.E.S.

This paper records the results of a few years work which was carried out wherever and whenever the opportunity arose. Fifty-eight species of gall midges are mentioned, and I hope to be able to add to this number. In attempting to rear the midges I have often met with failure; but the emergence of parasites has often compensated for this. I have set down all observations and comments which seemed to be of interest or value.

Lasioptera carophila F. Loew. Galls of this species were found on Wild carrot (*Daucus carota* L.) at Drayton on 29th August, 1951. They consisted of pinkish, reddish and almost purple swellings at the point of insertion of the umbellules and at the base of the umbel itself. One gall contained a deep orange larva.

L. rubi Heeger. Galls taking the form of walnut-shaped swellings on the stems of Brambles (*Rubus fruticosus* L. agg.) were found at Costessey, 25th August, 1951; Drayton, 25th August, 1950, and 1st August, 1952; Old Buckenham, September, 1950; Stow Bedon, August, 1952; Thompson Water, 1st May, 1952. The same type of gall had been caused by this midge on Raspberry (*Rubus idaeus* L.) at Caston, April, 1952; Old Buckenham, October, 1950. Galls in the form of terminal irregular woody masses were found on *Rubus fruticosus* L. agg. at Costessey, 25th August, 1951; Old Buckenham, September, 1950. Larvae in the Drayton galls (1950) were alive fourteen days after collection, but I was not successful in rearing midges.

Trotteria ligustri Barnes. Larvae found in unopened flower buds of Privet (*Ligustrum vulgare* L.) at Drayton, 2nd and 12th August, 1952; Bluebell Road, Norwich, 9th September, 1954. Drayton is the type locality of this species, of which Barnes (1954) has described the male and the larva. The type and paratypes, three males, emerged on 16th June, 19th June and 18th July, 1953, from the galls collected at Drayton on 12th August, 1952.

Rhabdophaga heterobia (H. Loew). 'Button-top' galls caused by this midge were found on *Salix triandra* L., beside the river Wensum in Norwich, 31st August, 1951, and at Earlham Park, Norwich, 28th August, 1954.

R. marginemtorquens (Bremi). Marginal leaf-rolls on *Salix cinerea* L., at Sutton, September, 1952, and on *Salix ?cinerea* L. at Shipdham, 12th August, 1951, may have been due to this midge. Houard (1908) lists *Salix cinerea* L. as one of the food-plants of this insect, but Barnes (1949) considers that it should be re-established.

R. rosaria (H. Loew). 'Rosette' galls of this species were found on *Salix alba* L. at Caston, August, 1952; Norwich, 27th August, 1951; Shipdham, August, 1951; Sutton Broad, September, 1952; Wroxham, 31st August, 1952. What were probably old galls were found on *Salix* sp. at Old Buckenham, 8th February, 1950.

R. terminalis (H. Loew). Curled, folded terminal leaves containing gregarious orange-red larvae of this midge were found on *Salix alba* L., at Earlham Park, Norwich, 31st August, 1954; on *Salix* sp. at the Dolphin footbridge, Norwich, 27th August, 1951; on *Salix ?fragilis* L., at Drayton, 20th August, 1951.

Rhabdophaga sp. Large swellings on stems of *Salix atrocinerea* Brot., at Old Buckenham, 29th June, 1951, and similar galls on *Salix cinerea* L., at Sutton Broad, September, 1952, were probably caused by *R. salicis* (Schrank) or *R. dubiosa* Kieffer. Parasites emerged from these galls.

Dasyneura acrophila (Winn.). Galls containing the gregarious white larvae were seen on an Ash (*Fraxinus excelsior* L.) at Old Buckenham, May, 1951.

D. angelicae Ruebs. Orange larvae of this midge were present in closed, swollen, pinkish flowers of *Angelica sylvestris* L., on the river-bank, Earlham Park, Norwich, 6th September, 1954.

D. crataegi (Winn.). The terminal 'Rosettes' were evident on Hawthorn (*Crataegus*) at Caston, August, 1951 and 1952 (the latter containing pale orange gregarious larvae); Costessey, August, 1951; Crostwick, August, 1950, 1951, 1952; Drayton, August, 1950, 1951, 1952; Edingthorpe, 1st September, 1950; Letton Hall, August, 1952; Norwich, August, 1951, August-September, 1954; Old Buckenham, September, 1949, 16th July, 1950; Shipdham, 2nd September, 1952; Spixworth, August, 1950; Sutton, September, 1952.

D. engstfeldi (Ruebs.). Houard (1908) describes the gall of this insect from leaves of Meadowsweet (*Filipendula ulmaria* (L.) Maxim.). On the upper surface of the leaf it consists of a swelling, oval in outline, whose greenish-yellow, wrinkled area is surrounded by a reddish zone. On the under surface a corresponding depression contains a larva which is white at first and later becomes pale red. Galls similar to this were found on Meadowsweet leaves at Crostwick on 4th August, 1951. The reddish zone was clearly marked, but the central area was a pale orange-brown. In some galls all, or part of, the central area had fallen away, leaving a hole surrounded by a red border. Unfortunately, there were no larvae present in any of the galls. Galls of the same type were found on Meadowsweet leaves at Shropham, August, 1952.

D. epilobii (F. Loew). Swollen, ovoid and unopened flower buds of Rose-bay Willow-herb (*Chamaenerion angustifolium* (L.) Scop.) containing the brownish-orange larvae of this midge were present at Caston, 12th September, 1951, and August, 1952; Drayton, 25th August, 1950; Letton Hall, August, 1952; Old Buckenham, July, 1950 and 1951. On 20th July, 1951, about 40 galled flower-buds collected at Old Buckenham were placed in a jar containing soil and several larvae went into the soil almost immediately. On 7th August, 1951, midges began to emerge and continued to do so until 14th

August, 1951. Parasites emerged between 7th and 23rd August, 1951, and many of them are known to have come from the galled buds themselves, as they were all removed to a separate cardboard box on 9th August, 1951. Many living and moving midge larvae were noticed in and on top of the soil on 9th August, 1951, and two midge larvae, one alive and moving, were with the galled buds in the box on 23rd August, 1951.

D. filicina (Kieffer). Gall rolls were found on Bracken (*Pteridium aquilinum* (L.) Kuhn) at Crostwick, 25th August, 1950, and 31st July, 1951; Drayton, 29th August, 1951; Old Buckenham, 23rd June, 1950, and July, 1951.

D. fraxinea (Kieffer). Galls consisting of circular, flattened, pustule-like malformations on leaves of the Ash (*Fraxinus excelsior* L.) were found at Caston, 12th September, 1951, and August, 1952; Crostwick, 4th August, 1951; Drayton, 30th June, 1951; East Harling, 19th June, 1951; Old Buckenham, 20th June, 1951; Shropham, 21st June, 1951.

D. fraxini (Kieffer). Galls were present on the mid-ribs of Ash (*Fraxinus excelsior* L.) leaflets at Banham, 17th June, 1951; Caston, August, 1952; Crostwick, August, 1950 and 1951; Drayton, August, 1950 and 1952, 30th June, 1951; Earlham Park, Norwich, 26th August, 1954 (containing larvae); East Harling, 19th June, 1951; Old Buckenham, September, 1949, June, 1950, May, 1951; Shropham, August, 1952; Sutton, September, 1952; Wheatfen Broad, 15th September, 1950.

D. fusca Ruebs. Unopened blossoms of Hawthorn (*Crataegus*) contained gregarious orange larvae at Old Buckenham, 7th June, 1951. I was not successful in rearing midges, but Dr. Barnes, who has examined preserved larvae, considers that they are a *Dasyneura* species, almost certainly *fusca* Ruebs.

D. glechomae (Kieffer). The gregarious white larvae were present in the gall-pouch on Ground ivy (*Glechoma hederacea* L.) at Old Buckenham, 4th July, 1951.

D. kiefferiana (Ruebs.). Houard (1909) describes the gall of this midge as a marginal roll on the leaves of Rose-bay Willow-herb (*Chamaenerion angustifolium* (L.) Scop.), which contains a solitary, yellowish-white larva. I have found such galls at Crostwick, 2nd August, 1951, and Drayton, 8th August, 1951, and in each case the gall contained a solitary pale orange or yellowish larva. Two midges emerged from the Drayton galls on 25th August, 1951. Further marginal rolls were found on leaves of this plant at Crostwick, 18th August, 1951, and Old Buckenham, 20th July, 1951, but the larvae were gregarious and white. I did not succeed in rearing midges. A marginal gall on the same plant was in the process of withering away at Caston, 12th September, 1951.

D. lathyricola (Ruebs.). Barnes (1946) states that when the gre-

garious, reddish larvae of this midge are present on *Lathyrus pratensis* L., (Meadow pea), the two terminal stipules become discoloured and swollen at their bases and the terminal shoot stops further growth and dies. This had happened to a plant of *L. pratensis* at Old Buckenham, 11th July, 1951. I noted that the larvae were gregarious and of a bright orange colour, almost with a reddish tinge. Unfortunately, I was unable to rear midges.

D. plicatrix (H. Loew). The gregarious white larvae of this midge are found in contorted and twisted leaves on the growing shoots of wild brambles (*Rubus fruticosus* L. agg.). They were found at Caston, 12th August, 1951, and in August, 1952; Costessey, 25th August, 1951; Crostwick, 31st July, and 2nd August, 1951; Drayton, 30th June, 1951; Norwich, 31st August, 1951, and at three different localities within the City on 25th August, 26th August, and 9th September, 1954; Old Buckenham, 13th June, 1951; Shropham, August, 1952; Sutton, September, 1952. A solitary midge emerged from the Drayton material during July or early August, 1951.

D. pustulans (Ruebs.). The gall appears on the under surface of Meadowsweet (*Filipendula ulmaria* (L.) Maxim.) leaves as a small circular depression containing a solitary white larva which is sometimes tinted greenish. On the upper surface there is a slight projection surrounded by a clear yellow circular zone. Such galls containing larvae were seen at Drayton, 14th August, 1951; Norwich, 17th and 26th August, 1954; Old Buckenham, July, 1950, and 23rd June, 1951; Shropham, 21st June, 1951. Empty galls were found at Crostwick, 25th August, 1950, and 31st July, 1951; Norwich, 31st August, 1951; Shropham, August, 1952.

D. ranunculi (Bremi-Wolf). The gregarious orange, or orange-red, larvae were present in folded leaves of a buttercup (*Ranunculus* sp.) at Crostwick, 2nd August, 1951. The galls were placed in a jar and midges emerged 14th-20th August, 1951. The midges had pupated in white cocoons in the folded leaves, from which the empty cocoons protruded. On 2nd September, 1951, further galls containing pale orange larvae were found on *Ranunculus* sp. at the same place. On 28th August, 1954, galls containing larvae were found on *Ranunculus acris* L., at Earlham Park, Norwich.

D. sisymbrii (Schrank). Larvae were present in swollen flowers of *Barbarea vulgaris* R.Br., (Yellow Rocket) at Old Buckenham, June, 1950, and 17th June, 1951. Pupation took place in white cocoons in the galls and midges emerged (dates not recorded).

D. tiliamvolvens (Ruebs.). The orange-red larvae of this midge were present in marginal rolls found on the leaves of Lime (*Tilia* sp.) at Old Buckenham, June, 1950, May and 7th June, 1951. Galls from the last batch of material were placed on soil in a jar, and larvae could be seen in the soil on 20th September, 1951. I did not rear midges, but three parasites emerged during July and August,

1951. Mr. R. D. Eady has very kindly identified these as *Torymus tilicola* Ruschka (1 male, 2 females). Galls of the same insect were found on young Lime leaves at Earlham Park, Norwich, on 12th May, 1955. The small, immature larvae were white and gregarious.

D. trifolii (F. Loew). Galls of this midge containing white cocoons were collected at Caston, 12th August, 1951; Crostwick, 18th August, 1951; Shipdham, 12th August, 1951. They were taken from *Trifolium repens* L. (White clover). On 22nd August, 1951, midges were found to have emerged from the Crostwick and Shipdham galls. Further galls were taken from *Trifolium* sp. at Drayton, 7th August, 1951 (white cocoons); Norwich, 31st August, 1951 (one pale orange larva seen); Norwich, 17th August, 1954 (containing white larvae); Caston, August, 1952 (orange larvae); Sutton, September, 1952 (orange larvae).

D. ulmariae (Bremi-Wolf). Galls were seen on leaves of Meadow-sweet (*Filipendula ulmaria* (L.) Maxim.) at Crostwick, August, 1950, June-July, 1951, July, 1952; Drayton, 30th June, 1951; Norwich, August, 1951, August, 1954, 27th May, 1955; Old Buckenham, 31st May, 1949, 7th June, 1951; Shropham, 21st June, 1951, August, 1952; Sutton, September, 1952; Wheatfen Broad, September, 1950.

D. urticae (Perris). Nettles (*Urtica dioica* L.) bore galls of this midge at Caston, 12th August, 1951, August, 1952; Costessey, 25th August, 1951; Crostwick, 25th August, 1950 (P), 31st July, 1951, 31st July, 1952; Drayton, 25th August, 1950 (P), 20th August, 1951; Edingthorpe, 1st September, 1950 (P); Norwich, 31st August, 1951, 26th August, 1954; Old Buckenham, 22nd September, 1949 (P), September, 1950; Oxborough, 14th September, 1950. Mr. R. D. Eady has very kindly identified examples of *Torymus urticae* Perris (= *T. macropterus* (Wlk)) which emerged from the four gatherings marked (P).

D. viciae (Kieffer). On 2nd August, 1951, a plant of Tufted vetch (*Vicia cracca* L.) growing amongst Gorse on a damp meadow at Crostwick bore masses of pod-like leaflets at the ends of the stems. Some 'pods' contained gregarious yellowish and white larvae, while a few sheltered solitary pale yellowish larvae. I was not successful in rearing midges, but it is possible that *D. viciae* was the insect concerned. Similar galls were found on the same plant at Caston, August, 1952, but no larvae were seen. Pod-like leaflets containing gregarious white larvae were found on *Vicia* sp. at Earlham Park, Norwich, on 28th August, 1954. I sent all the material to Dr. Barnes at Rothamsted. Early in October, 1954, he informed me that midges had been emerging.

Taxomyia taxi (Inchbald). The globe artichoke-shaped galls were seen on Yew (*Taxus baccata* L.) at Caston, August, 1952; Letton Hall, August, 1952; Old Buckenham, February, 1950.

Jaapiella bryoniae (Bouché). The galls on the shoots of White

Bryony (*Bryonia dioica* Jacq.) were found at Caston, 12th September, 1951 (larvae white with a slight pinkish or orange tinge), August, 1952 (no larvae seen); Costessey, 25th August, 1951; Crostwick, 18th August, 1951 (larvae white with a faint pinkish tinge, especially at the front); Drayton, 14th August, 1951; Norwich, 7th September, 1954 (larvae white); Shropham, August, 1952. The galls from Crostwick were placed in a jar containing soil and some larvae entered the soil at once (18th August, 1951). Midges started emerging on 31st August, 1951, and continued to do so almost daily until 10th September, 1951. Pupation took place in white cocoons in the soil.

J. veronicae (Vallot). The white-felted galls on Germander Speedwell (*Veronica chamaedrys* L.) occurred at Banham, 17th June, 1951; Caston, 12th August, 1951, and August, 1952; Costessey, 25th August, 1951; Crostwick, August, 1950, July, 1951 and 1952; Drayton, 7th August, 1951, 2nd August, 1952; East Harling, 19th June, 1951; Norwich, 26th August, 1954 (galls containing pupae), at another place in the city on 9th September, 1954; Old Buckenham, 20th June, 1949, 28th September, 1949, June, 1950, 13th June, 1951; Oxborough, 14th September, 1950; Shropham, 21st June, 1951, August, 1952; Sutton, September, 1952. Midges emerged from the galls collected at Old Buckenham on 13th June, 1951, during July, 1951.

Cystiphora sonchi (F. Loew). Gall-pustules were found on the leaves of Corn sow-thistle (*Sonchus arvensis* L.) at Norwich on 31st August, 1951. Several leaves, each bearing from three to eight galls, were kept indoors and midges emerged on 4th and 5th September, 1951. Pupation had taken place in white 'silken' cocoons in the galls. Galls containing solitary orange larvae were found on the same plant at Shipdham, 2nd September, 1952.

Geocrypta galii (H. Loew). Galls as illustrated by Houard (1909) were found on the stems of Ladies' Bedstraw (*Galium verum* L.) at Old Buckenham, 17th May, 1950; 3rd June, 1951; Shropham, 21st June, 1951. What appear to be galls of the same midge were found on Rough water bedstraw (*Galium uliginosum* L.) at Crostwick, 25th August, 1950 (no larvae seen), 2nd August, 1951; Norwich, 31st August, 1951, 28th August, 1954. Except where indicated, pale orange larvae were present in the spongy gall masses. When the galls collected at Crostwick on 2nd August, 1951, were placed in a jar, larvae went into the soil at once. No midges were reared, but parasites, which Mr. R. D. Eady identified as *Torymus galii* Boh., emerged between 20th August and 5th September, 1951.

Wachtliella persicariae (L.). The brightly coloured marginal rolls on leaves of *Polygonum amphibium* L., var. *terrestre* were found at Crostwick, 25th August, 1950, 31st July, 1951; Drayton, 23rd August, 1949, 25th August, 1950 (P), 30th June, 1951; Norwich, 31st August, 1951 (P); Shropham, August, 1952; South Walsham

Broad, 31st August, 1952; Stow Bedon, August, 1952; Sutton, September, 1952. Parasites which Mr. R. D. Eady has identified as *Torymus persicariae* Mayr emerged from the gatherings marked (P). Many midges emerged indoors during July, 1951, from galls collected at Drayton on 30th June, 1951. Pupation had taken place in the galls in white silken cocoons, many empty examples of which were found on the outside of the galls or protruding from neatly made holes in the galls.

W. rosarum (Hardy). The galls, leaflets folded in the form of a pod containing gregarious orange larvae, were collected from Wild Rose (*Rosa canina* L. agg.) at Drayton, 30th August, 1950 (P), 8th August, 1951; Norwich, 9th September, 1954; Old Buckenham, June, 1950, and July, 1951 (these galls also contained white larvae of the inquiline gall midge *Macrolabis luceti* Kieffer). Mr. R. D. Eady identified parasites which emerged from the gathering marked (P) as *Torymus viridis* Foerst. Empty galls were found at Caston, 12th August, 1951, August, 1952; Costessey, 25th August, 1951; Crostwick, 28th August, 1950, 2nd August, 1951; Edingthorpe, 1st September, 1950; Shipdham, 2nd September, 1952; Shropham, August, 1952; Stow Bedon, August, 1952.

W. stachydis (Bremi-Wolf). Galls of this midge containing the gregarious orange larvae were noted on Hedge woundwort (*Stachys sylvatica* L.) at Caston, 12th August, 1951; Crostwick, 25th August, 1950; Old Buckenham, 20th June, 1950; Norwich, 9th September, 1954.

Janetiella lemei (Kieffer). Galls were found on leaf veins, petioles and small twigs of Wych elm (*Ulmus glabra* Huds.) at Caston, August, 1952; Norwich, 26th August, 1954 (the larvae had left the galls). Galls were noticed on English elm, *Ulmus procera* Salisb. (*U. campestris* auct. angl.) at Old Buckenham, 24th June, 1951. Further galls were found on *Ulmus* sp. at Caston, 12th August, 1951; Old Buckenham, 25th June, 1950, 13th June, 1951.

Zygiobia carpini (F. Loew). What appeared to be galls of this midge were found on leaves of Hornbeam (*Carpinus betulus* L.) at Old Buckenham, 15th June, 1951.

Craneiobia corni (Giraud). The unmistakeable galls of this insect were found on Dogwood (*Cornus sanguinea* L.) at Drayton, 25th August, 1950, 29th August, 1951, 1st August, 1952. Three cells were seen in each of the galls examined. Each cell contained a solitary, bright orange larva.

Physemocecis ulmi Ruebs. The gall-pustules were present on the leaves of English elm, *Ulmus procera* Salisb. (*U. campestris* auct. angl.) at Old Buckenham, 24th June, 1951. The numbers of pustules on five leaves examined were 1, 2, 4, 6 and 7 respectively. Each pustule contained a solitary white larva. Again I was unsuccessful in rearing midges.

Hartigiola annulipes (Hartig). What I have taken to be the galls of this midge were found on the leaves of Beech (*Fagus sylvatica* L.) at Caston, August and September, 1951, August, 1952; Drayton, August, 1950 and 1951; Norwich, August, 1954; Old Buckenham, July/September, 1949 and 1950, July, 1951; Oxborough, 14th September, 1950; Wheatfen Broad, 15th September, 1950.

Rondaniola bursaria (Bremi-Wolf). The cylindrical hairy galls were found on leaves of Ground ivy (*Glechoma hederacea* L.) at Caston, 12th August, 1951, August, 1952; Crostwick, 25th August, 1950, 2nd August, 1951, 31st July, 1952; Drayton, 25th August, 1950, 14th August, 1951; Norwich, 30th August and 9th September, 1954; Old Buckenham, 22nd September, 1949, early July, 1951; Oxborough, 14th September, 1950; Ringland, 25th August, 1949; Sutton, September, 1952.

Iteomyia capreae (Winn.). Galls on leaves of *Salix caprea* L., at Old Buckenham, 18th July, 1949, and June, 1950. At Wheatfen Broad, 15th September, 1950, the galls occurred on *Salix atrocinerea* Brot. The same galls were found on leaves of *Salix cinerea* L. agg. at Sutton, September, 1952; Spixworth, 31st August, 1950.

I. major (Kieffer). Galls were found on leaves of *Salix cinerea* L. agg. at Sutton, September, 1952; Spixworth, 31st August, 1950. What appears to be the same galls were seen on *Salix* sp. at Shipdham, 12th August, 1951.

Placochela nigripes (F. Loew). The orange larvae of this midge were found in swollen, unopened flowers of Elder (*Sambucus nigra* L.) at Old Buckenham during June, 1950, and on 11th July, 1951. It was noted that the 1951 larvae could not 'jump'. Barnes (1948) states that the larvae are gregarious, but in all the 1950 and 1951 galls which I opened there was only one larva. Dr. Barnes has examined preserved larvae from the 1950 galls and has identified them as *P. nigripes*.

Anisostephus betulinum (Kieffer). Galls were collected on Birch (*Betula*) leaves at Old Buckenham in early July, 1951, and at Sutton, September, 1952. In each case the solitary larvae were present.

Contarinia medicaginis Kieffer. Swollen and closed flowers of Lucerne (*Medicago sativa* L.) contained the gregarious, shiny, pale yellow-white larvae at Drayton, 8th August, 1951. The galls were put into a jar indoors and larvae went straight into the soil. Two midges emerged on 25th August, 1951, and another the next day.

C. steinii (Karsch). The gregarious orange larvae were found in swollen and unopened flower buds of *Melandrium album* (Mill.) Garcke (White Campion) at Caston, August, 1952; Costessey, 25th August, 1951; Drayton, 25th August, 1950; Old Buckenham, 20th July, 1951; Oxborough, 14th September, 1950; Shropham, August, 1952. The larvae were present in the swollen unopened flower buds of *Melandrium rubrum* (Weig.) Garcke (Red Campion) at Earlham

Park, Norwich, on 26th August, 1954. Some larvae went straight into the soil in a jar that day and midges emerged during the autumn, 1954.

C. tiliarum (Kieffer). The globular galls were noted on the twigs, flower stalks and petioles of Lime (*Tilia*) at Old Buckenham during June, 1949 and 1950. Old galls most probably caused by this insect were seen on Lime twigs at Caston, April, 1952.

Contarinia sp. Barnes (1955) has reported rearing one female *Lestodiplosis* (emerged 27th June, 1953) and six female *Contarinia* (emerged 6th-11th August, 1953) from white gregarious larvae which I found under acorns in the acorn-cups on an Oak (*Quercus robur* L.) at Caston during August, 1952.

Ametrodiplosis thalictricola Ruebs. Swollen fruits of Meadow rue (*Thalictrum flavum* L.) containing the pale orange larvae were collected at Norwich, 31st August, 1951, and 30th August, 1954. Although larvae from the 1951 gathering went into the soil, I was unable to rear midges.

Macrodiplosis dryobia (F. Loew). The galls were found on leaves of Pedunculate Oak (*Quercus robur* L.) at Norwich, 1st June, 1955 (containing tiny gregarious white larvae); Old Buckenham, 23rd June, 1950, 7th June, 1951; Shropham, August, 1952; Sutton, September, 1952.

M. volvens Kieffer. The galls were seen on leaves of Pedunculate Oak (*Quercus robur* L.) at Caston, August, 1952; Letton Hall, August, 1952; Norwich, 25th August, 1954; Old Buckenham, 23rd June, 1950, and 7th June, 1951; Sutton, September, 1952.

Putoniella marsupialis (F. Loew). Galls consisting of pouch-shaped swellings were found on the mid-veins of leaves of *Prunus* sp. growing in the form of 'suckers' from a roadside hedgerow at Drayton, small round holes in the sides. I saw a few bright reddish-orange 8th August, 1951. Many of the galls were empty and some bore larvae (dead) in the galls.

Loewiola centaureae (F. Loew). Galls in the form of slight swellings surrounded by violet borders and containing yellow larvae were found on a leaf of Knapweed (*Centaurea nigra* L. agg.) at Shropham. August, 1952.

Vice-comital Distribution of the Localities Mentioned

East Norfolk (v. c. 27): Banham, Costessey, Crostwick, Drayton, Edingthorpe, Norwich, Old Buckenham, Ringland, South Walsham Broad, Spixworth, Sutton, Wheatfen Broad, Wroxham.

West Norfolk (v. c. 28): Caston, East Harling, Letton Hall, Oxborough, Shipdham, Shropham, Stow Bedon, Thompson Water.

Acknowledgments

I am very grateful to the following gentlemen for their help: Dr. H. F. Barnes, Rothamsted Experimental Station, whose interest,

encouragement and writings have led me from gall-collecting to take rather more interest in the insects responsible for the galls; Mr. R. B. Benson, British Museum (Natural History), for putting me in touch with Mr. Eady; Mr. R. D. Eady, Commonwealth Institute of Entomology, for determining the parasites and for considerable help in connection with gall studies generally; The Linnean Society of London for the loan of books; Mr. M. Niblett, for the gift of copies of many of his numerous papers.

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PARASCOTIA FULIGINARIA (L.) (LEP.: PLUSIIDAE) IN SURREY

Six larvae were found feeding on a fungus under a birch log on the 18th April, 1955, at Wisley Common, Surrey. One larva was preserved; the five remaining pupated and imagines emerged between 4th and 11th July. Although recorded from several adjoining localities, this is, I believe, the first record for Wisley.

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ERRATA. Vol. 6, No. 3. Page 149, line 29, for 'Large White' read 'Black-veined White'.

Page 142, line 39, for 'Sussex' read 'Essex'.

Page 163, end of line 17, add '*Lycaena*'. Line 18, for '*subrosoa*' read '*subrosea*', for '*coenosa*' read '*caenosa*'.

A LIMITED NOTE ON THE EGG, LARVA AND LOCAL DISTRIBUTION OF *APATURA IRIS* (LINN.) (LEP. NYMPHALIDAE)

By R. F. AITKEN

On the 28th July, 1953, during a survey of the immediate locality surrounding my place of business for possibilities as a field for entomological study, which would of necessity be limited to a lunch-break time factor, I was exceedingly pleased to observe a solitary *A. iris* ♀ hovering in proximity to extensive outcrops of *Salix caprea* adjoining chestnut and spruce plantations. I did not attempt capture however, although I do not possess specimens, but endeavoured to attain closer inspection with a view to ascertaining any apparent preference by the insect in relation to the food plant and her egg-laying activities (there being both *Salix caprea* and *atrocinerea* present). I was denied this study unfortunately as she flew away, but after a search of the outer branches of *S. caprea* where I noticed she had alighted I was rewarded with an egg which was adhering to the upper surface of the leaf about four feet from the ground. This was indeed good fortune and yet I remember how remarkably prominent it was on discovery, displayed on an old, tough and extremely dark leaf, exactly in the centre and being of such light pigmentation that the contrast was only too obvious. If this is normal practice I feel that such eggs must be short-lived and provide tit-bits for many of our ornithological foragers. Subsequent visits to the area at daily intervals did not produce further eggs and I have only witnessed a total of two *A. iris* in the locality to date and both were females.

The foregoing and the summary below relate to the all too short history of the events that followed for the next fourteen days and which may be of some interest to readers as geographical distribution data.

Locality: Langhurst, Horsham, Sussex.

Date and time taken: 13.45 p.m. 28.7.53. Collected almost immediately after deposit.

Egg: Colour—Pale green.
Shape—Cylindrical, broader at base with domed top.
Size—1.5 mm., approx., in height and width at base.
Ribs—14, well defined.

No change was observed until 30.7.53, when a fine dark circumambient line appeared a little above the base, thereafter no change until 4.8.53, when the pigmentation became paler with thickening of the darker band towards the top of the egg. The following day, 5.8.53, the general colour had become almost grey and on the morning of 6.8.53, it was observed that the encircling band had moved to the region of the micropyle leaving the lower portion opaque pale grey-green.

Larva.

The larva emerged in the early hours of Tuesday, 11.8.53, and measured 4 mm. in length and .5 mm. in lateral width, with a comparatively large dark brown head, a pale yellowish-green body with three darker lines running along the back. It was very active up to about four hours before it died, and although a special cage was constructed to contain the food plant, using a wooden frame and mosquito netting with an insulated lower compartment to house a water container, it nevertheless, at the end of three days, shrivelled up. A constant supply of fresh food was furnished daily collected within a few minutes from the original tree, so I was led to believe that the loss was probably due to lack of atmospheric moisture, the weather being exceedingly hot and dry during this particular week of 1953. The larva appeared perfectly comfortable and very active at my last observation and had symptoms been present the atomiser may have saved the day.

Being an only specimen I was loth to subject it to microscopic investigation at the onset and it had shrivelled so much afterwards, when I was again able to observe it, that it was almost useless for factual study.

I believe the demarcation line of the Surrey-Sussex border in the area to be perhaps almost the limit of range for this insect which probably accounts for the few specimens seen, and yet farther west along the border mid-way between Horsham and Guildford I observed numbers of *Apatura iris* (L.), both males and females, in adjacent oak woods during the years 1946 and 1947, counting as many as 15 (11 ♂♂ and 4 ♀♀) on one occasion during daily observations of one hour duration, but this figure would be subject to a ± factor which I was unable to calculate.

Ewhurst,
Cranleigh,
Surrey.

2nd May, 1955.

LEPIDOPTERA FROM THE PUTNEY DISTRICT

I much regret that the following species were recorded in error on a previous occasion.

Eupithecia denotata jasioneata Crewe, Geometridae.
Acrobasis tumidella (Zinck.), Pyrales.
Platyptilia calodactyla (Schiff.), Pyrales.

One addition can be recorded, and this is:

Platyptilia pallidactyla (Haw.).

H. D. SWAIN.

47 Dryburgh Road,
Putney, S.W.15.
23rd May, 1955

APOROPHYLA LUTULENTA SCHIFFERMUELLER, 1775 AND *A. LUNEBERGENSIS* FREYER, 1848 (LEPIDOPTERA: AGROTIDAE)

By A. J. WIGHTMAN, F.R.E.S.

When Tutt (1892) was compiling his notes on *lutulenta* for his British Noctuae and Vars., he had considerable difficulty in correlating the various descriptions and statements by past authors concerning the form *lunebergensis* Freyer. His findings and conclusions are given in detail on pages 53-59 in Vol. 3 of his work.

His main difficulty was to fix the type of this form since the name had been applied to a number of not too similar forms. Staudinger (1871, Cat. 2, p. 97) had summarized *lunebergensis* as 'nigricans fasciis distinctis albis' and this had been accepted on the Continent as satisfactory. Tutt pointed out, however, that this agrees neither with Freyer's description nor figure.

According to Tutt, Freyer says '*lunebergensis* was named by Councillor Heyer and communicated to me. It has the greatest similarity to my *N. tripuncta,* plate 501, only it is smaller and without the white spots in the reniform. Mr. Heyer writes: 'For some years now the larvae of this species have not been obtained by reason of the new railway being carried through the heath where I discovered them. The forewings are black-brown, the third band somewhat lighter, the stigmata the same colour at the bands, the claviform not visible, fringes brown, body ash grey above and below.' (1848, *Neuere Beitrage,* **6**, p. 72.)

Tutt then described Freyer's figure of *lunebergensis* as follows: 'Anterior wings glossy black with slight purplish tinge, the basal elbowed and subterminal lines darker, an angulated narrow central shade very dark and quite black. Hindwings with dark nervures and a row of dots on the nervures (pl. 526, fig. 2)' and said that he was unable to see how Staudinger's summary could be made to fit such a figure. He agreed that forms resembling *sedi* Guenée were found in Ireland and Scotland on the same ground as the black form he was to set up as typical *lunbergensis* and in justification of this last quoted Freyer's remarks as to the similarity of his (Freyer's) *tripuncta* and *lunebergensis*. 'It has the greatest similarity to *tripuncta* . . . . and pointed out that Freyer's *tripuncta* was described as black-brown like *æthiops* (= *nigra*). To me it seems likely that Freyer's remark meant no more than that the new insect *lunebergensis* was allied to his *tripuncta* which in fact was a form of *lutulenta,* i.e. *lunebergensis* was near to *lutulenta* specifically. With the black form as his typical *lunebergensis* Frr. Tutt now referred the *sedi*-like form to that variety and named the black form with white transverse lines *albidilinea,* saying that in his opinion this was the form to which Staudinger's summary referred. Tutt's type of *albidilinea* was from Orkney. It

does not seem to have occurred to Tutt that on the Continent *lunebergensis* was treated as at least a race and the name applied to all the various forms of that race.

Barrett (1897, Lepidoptera of the British Islands, Vol. 4, p. 273) says of these Irish and Scottish insects: 'This very beautiful race is usually known in these islands as var. *lunebergensis*, but considerable doubt exists as to whether the varietal name is correctly applied.' So Barrett rated *lunebergensis* as racial and not as a mere form of *lutulenta*.

The Rev. C. R. N. Burrows (1899, *Ent. Rec.*, **11**, p. 155) then took up the subject saying that, despite Tutt's notes (*loc. cit.*), he had been unable to allocate the forms he had obtained of this species *lutulenta* to any of the names listed by Tutt and as a result had sought Tutt's help.

It is therefore not surprising to find that Burrows supports all Tutt's findings and summarises the named forms of the species as follows:

forewings ashy grey ..... *consimilis* Steph.
„ black-brown ..... *lutulenta* Schiff. (Borkhausen auct.)
„ ashy grey, black central band ..... *sedi* Gn. (Guenée says darker band not black.)
„ glossy black, blacker lines ..... *lunebergensis* Freyer
„ white spots in reniform ..... *tripuncta* Freyer

and goes on to say, 'In this list I noticed that the type form alone has a brownish coloration, now with the exception of seven specimens, the whole of my captures are brownish while at the same time they follow closely the form of many of the above aberrations, e.g. there is no *sedi* but there is a reddish-brown form with a dark central band. . . .'

Strange to say, in describing his new forms he calls one of them ashy grey, and when Turner (1843, British Noctuae and Vars. Suppl. Notes, p. 131) gave summaries, he did not stress that these forms, or at least two of them, were described and named in order to distinguish the slaty grey from the brownish grey.

Burrows quotes *sedi* Gn., as being black banded, and in fact Duponchel and later Guenée called it darker banded.

It is abundantly clear from Burrows's text that his ab. *cinerea* is the same colour as *consimilis* Steph., which is a unicolorous dull brownish grey no better marked than the typical form, but in his full description it is compared to *viminalis* Fab., as to colour and called ashy grey, differing from *consimilis* by having a distinct central band. His ab. *approximata* is a *sedi*-like form but brownish grey not slaty grey. His *unicolor* is like the typical form but less marked and as to this Turner (*loc. cit.*, p. 131) says that he has the type form and it is at that time (1943) not so *unicolorous*. This name can have no standing as apparently unmarked forms have markings in certain lights. Burrows's article is worth studying if only to see how misleading such

a term as ashy grey can be when the description is divorced from the text of the article. It also shows that Tutt had never seen south of England *lutulenta* as black as his Irish *lunebergensis* (black form). Some that Burrows had taken came nearest in colour. Of ninety-nine wild caught *lutulenta* at Mucking, Essex, Burrows divided them as follows: typical 24 males, 29 females; ab. *unicolor* 18 males, 16 females; ab. *cinerea* 3 females; ab. *approximata* 2 males, 3 females, and so-called *lunbergensis* forms by reason of blackness 2 males, 2 females.

Then Warren (Warren *in* Seitz, 1910, Palaearctic Noctuidae, **3**, p. 123) looking at the matter from a continental point of view, says, '*lunebergensis* Frr., (= *albidilinea* Tutt.) 30b, from N.W. Germany, Holland and Scotland. Purplish grey with all the lines and stigmata very neatly marked, and edged in paler, the median area darker, a decidedly smaller and neater insect than the type (i.e. *lutulenta*)' and adds: 'this description is made from a specimen in the Freyer collection marked by himself' and goes on: '*sedi* Dup., (*pallida* Calb.) is ashy grey with the three lines dark and neatly marked median area often dark' and ends by saying, 'It seems to me that this may really be identical with *lunebergensis* which Guenée only knew from Herrich-Schaeffer's figures. The insects described by Tutt in Brit. Noct. Vars, **3**, p. 58 as *sedi* from Sligo, Ireland, Loch Laggan and Rannoch, Scotland, agree perfectly with *lunebergensis* Frr.'

From this it is clear that Warren ignored Tutt's claim that the black blacker marked form of *lunebergensis* is the typical one and placed the black form with the white lines, which Tutt called *albidilinea*, as the *sedi*-like form which he (Warren) treats as the typical *lunebergensis*. No doubt Warren is right in saying all three of Tutt's Irish and Scotch forms are forms of *lunebergensis*. Warren is certainly in error in saying *sedi* Gn., may be no more than *lunebergensis* Frr. It is a form of the larger insect *lutulenta*. His description of typical *lunebergensis* must be accepted.

Draudt (Draudt *in* Seitz, 1938, Palaearctic Noctuidae, **3**, p. 136) goes over the ground again and says, 'I cannot bring myself to enumerate this as a form of *lutulenta*. I hold same to be a genuine species even though Diehl's examination of the genitalia showed that same are 'practically' identical. The general impression differs too much, *lunebergensis* is smaller, seems to have narrower wings, and in certain districts occurs concurrently with *lutulenta*. I have typical specimens from Ireland and S. France before me.' He goes on to say that the extreme black form has been called *aterrima* Warren. This is the name now given to Tutt's black blacker marked form which he considered the typical one.

At the time I was not able to accept this second species idea chiefly I suspect because I had bred so many of the grey forms of *lutulenta* from wild taken larvae (Pulborough, Sussex) and they varied so widely in colour and markings that in the absence of something more

definite than Draudt's points, I thought *lunebergensis* might be merely another race or local form found in special terrain, of *lutulenta* Schiff. (Bork.), but its smaller size and more sharply marked pattern did intrigue me. So when Turner (1943, British Noctuidae and Vars., Suppl. notes, pp. 128-134) dealt with *lutulenta* I wrote a note criticizing some of Warren's figures, generally supporting the findings of Tutt and raising the matter of the distinctive size and shape of *lunebergensis* (Turner Supp. Notes, *Ent. Rec.* **3**, 131).

Unfortunately I received no proof of this note and when I saw it in print I found that a sheet had been omitted from the middle of it and what I was made to say was incorrect. This was put right at least in part by a corrective note on p. 134.

More recently I have obtained a better series of these smaller insects from the Isle of Lewis, Hoy, Orkney, Douglas in the Isle of Man, etc., and have seen a good many others. I am now quite satisfied that Draudt is right, and that two distinct species are involved, and I also agree with his allocation of the named forms except that *albidilinea* Tutt is not typical *lunebergensis* but a blacker form with white lines.

I find it impossible to accept that if *lutulenta* and *lunebergensis* were but forms of a single species both forms would be so widespread. Local races surely are likely to be restricted in habitat! Yet in this case *lutulenta* is found in England, France, Spain, Germany and Italy among other places while *lunebergensis* occurs in Ireland, Orkney, Scotland, Isle of Man, France, Holland and throughout N.W. Germany, etc. Yet the races or species are quite easily distinguishable from each other everywhere.

I have no fresh morphological data but consider the fact that both insects have practically identical genitalia to be negative evidence as did Draudt and base my opinion on obvious differences I claim to see.

Culot (1909, Noct. and Geos., **1**, p. 177) says that the form *sedi* Dup., (Gn.) of *lutulenta* is very similar in appearance to *lunebergensis* Frr., but while the form *sedi* is found with the typical form of *lutulenta* practically throughout its range *lunebergensis* Frr., is much more local. He says further that the range of *lutulenta* is very extensive from South Scandinavia to Spain, Central France and Italy while *lunebergensis* is widespread in Germany. He remarks that *lutulenta* is surprisingly absent from several central European countries.

It seems to be abundantly established that where typical *lutulenta* is found there will also occur the aberrations *sedi, consimilis,* etc., but when *lunebergensis* is found there, in place of the above aberrations will be found the *lunebergensis* variations only. There are said to be places where the species overlap and that no intermediates occur.

To my eyes *lutulenta* is larger than *lunebergensis,* a heavier insect, diffuse of marking and having a rather square shape of wings with hindwings far less often distinctly marked than in next species but on occasion it does have a trace of these or similar marks. *Lunebergensis*

is a lighter insect and is smaller and more sharply marked, the forewings are more pointed and the hindwings usually have clear blackish dots on the inner line and dark veins.

I would suggest that anyone having a good varied series of both *lutulenta* and *lunebergensis,* should separate them by eye and arrange them in two vertical lines with the blackest specimens at the top and the lightest at the bottom, so arranging them that the similarly coloured forms of each series are side by side. It will then be found that the two series are also separated by locality, at least that was so in my case, and I found it impossible to introduce undersized bred *lutulenta* forms into the *lunebergensis* series. The more closely I scrutinized the insects to find an individual which could be either species the more distinct the species seemed to be. I can give no structural point of difference but I say I can see that they are distinct.

It may possibly be shown from extensive series of *lutulenta* that the smaller species *lunebergensis* occurs in the North of England or even that both species occur together in certain areas in these islands, as is said to be the case abroad. There is fortunately no difficulty in deciding to which species the various named forms belong. The variation of these two species is fairly parallel apart from the fact that *lutulenta* varies much more in detail than *lunebergensis.*

I summarize the named forms of *lunebergensis* as follows:

Purplish grey with neatly marked lines, pale edged, median area often dark and band-like ..... *lunebergensis* Freyer
(so called Irish and Scottish *Sedi.*)

Black purplish tinge, lined in black ..... *aterrima* Drank
(Tutt's typical *lunebergensis*)

Black, white lined ..... *albidilinea* Tutt

Probably as a result of the confusion between the two species no other forms have been named, but the forms covered by the typical name vary from blackish grey purple tinge with hardly any deepening of the colour in the central fascia to forms which are almost unmarked dove grey in inner and outer areas and very nearly black in central fascia.

The named forms in *lutulenta* are summarized as follows:

Black brown, little marking below the transverse lines and these only to be seen in paler red brown in certain lights ..... *lutulenta* Schiff. Bork.)
(*unicolor* Burr. is a slight modification)

As typical form but white spots in reniform ..... *tripuncta* Freyer
(a minor form)

Dull near unicolous cinereous grey ..... *consimilis* Stephens

Ashy grey as in consimilis Steph. but with definite darker central fascia ..... *cinerea* Durr.

Ashy grew (slaty tint) with central fascia forming a dark band ..... *sedi* Gn. (Dup.)

—ditto—but ground colour brownish grey or reddish pale brown, central band dark brown ..... *approximata* Durr.

All the above forms and many minor variation occur in Britain. Turner. Noct. & Vars. Supp. Vol. III, 1943, page 132 lists other continental forms.

pallida (Calb.), 1888 has yellowish brown forewings, a darker central shade *not banded* so it is not to be classed as a *sedi* form. Roman Compagna.

brunnea Scha, 1929 is a form not too different from the typical one but is browner and less blackish with a fulvous hue in some examples. Mostar.

decolor Daat, 1934 is an ochre-yellow form, an extreme of *pallida* calb. Rome.

Similar forms to the above three are likely to occur as odd aberrations in Britain.

Lutulenta is so variable in small details that a series could be built up to show the slightest transitions near black to pale slaty or bluish grey, but some of the forms are very local and scarce.

The larva of *lutulenta* varies greatly, but really high coloured larvae with red or purplish markings are exceptional. Buckler says a Scottish larva which he had was very heavily marked. It may be that under critical examination the larva of *lunebergensis* Freyer will show some distinction from that of *lutulenta* Schiff. (Bork.).

It would be nice to illustrate these forms in a coloured plate but too extravagant when the colour range is only from near black to pale slaty grey. It cannot be expected that the figures to which I refer below can be trusted to show shape differences or to be accurate as to size. Figures are seldom reliable in such matters. Nor is it possible with such variable species to restrict the varietal names to the exact description given. There must be latitude in the interpretation of all descriptions.

Following is a list of forms which I associate with *lunebergensis* and *lutulenta* respectively:—

lunebergensis Freyer ..... (typical form)	Seitz, Pal. Noc., **3**: pl. 30, figs. 4 and 5. Barrett, Lep. Brit. Is., **4**: pl. 166, figs. 1d.
f. *aterrima* Warren	Barrett, Lep. Brit. Is., **4**: pl. 166, fig. 1c. Blacker lined (but no white lines). Tutt's description of Fryer's figure is perfect.
f. *albidilinea* Tutt	same figure but wider white lines.
lutulenta Schiff. (Bork.) (typical form)	...Warren in Seitz, Pal. Noc., **4**: pl. 30, figs. 5 and 6. Culot, Noc. et Geos., **1**: pl. 32, figs. 14 and 15. Barrett, Lep. Brit. Is., **4**: pl. 166, figs. 1 and 1a.

f. *sedi* Dup. (Gn.) .....Seitz, Pal. Noc., **3**: Suppl. pl. 17, figs. f.3.
Barrett, Lep. Brit. Is., **4**: pl. 166, fig. 1b.

f. *consimilis* Steph. .....Seitz, Pal. Noc., **3**: pl. 30, fig. b2.
" " " " Suppl. pl. 17, fig. f2.

f. *aproximata* Burrows .....Seitz, Pal. Noc., **3**: pl. 30, fig. b1 (called *consimilis*).

f. *tripuncta* Freyer .....Seitz, Pal. Noc., **3**: pl. 30, fig. b3. (but with more white in reniform area).

f. *cinearea* Burrows .....Seitz, Pal. Noc., **3**: Suppl. pl. 17, fig. f3 (but brownish grey not slaty) a varient of *sedi* Dup. (Gn.).
Barrett, Lep. Brit. Is., pl. 166, fig. 1b.

f. *pallida* Calb .....Seitz, Pal. Noc., **3**: Suppl. pl. 17, fig. 4 (but browner with dark central shade). Roman Compagna.

f. *decolor* Drandt .....Seitz, Pal. Noc., **3**: Suppl. pl. 17, fig. 4. Rome.

f. *brunnea* Schaw .....as typical but brown or nut brown not black-brown.

The forms *pallida, decolor* and *brunnea* seem to be varients of a single local form which is more ochreous and less black-brown than the typical *lutulenta.*

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WHAT NEXT?

By R. M. Mere

In 1951 Baron de Worms reviewed the new species of Butterflies and Moths (excluding Micros.) added to the British List from the early years of the century to the end of 1950. Since this review, *Calophasia lunula* Hufn., (The Toadflax Brocade) has changed its status from a very rare migrant to a local but breeding resident (Classey 1954). *Hydraecia hucherardi* Mab., (The Large Ear) has been discovered, and is a breeding resident (Kettlewell 1954), and *Cryphia divisa* Esp., has been recorded as a casual migrant (Haggett 1954). What next are we to expect?

Discoveries may be divided into four groups. First, a species formerly found but believed extinct may be rediscovered. Secondly, what is regarded as a single species may be separated into two good species or more: for example, *Diarsia rubi* View. (The Square Spot Rustic) and *D. florida* Schmidt (The Marsh Square Spot). Thirdly, species may spread from the Continent as migrants or vagrants, and in some cases establish themselves: for example, *C. lunula.* And fourthly, an unknown species may be found to be resident and apparently of long standing, like *H. hucherardi* and *Luceria virens* Linn., (The Claddagh).

Let us in the first place consider the first group, the rediscovery of a supposedly extinct insect. Probably more collectors have sought unsuccessfully for *Epicnaptera ilicifolia* Linn., (The Small Lappet) than any other species. Yet it probably still survives, and I understand that one was taken within the last twenty-five years. If someone were to work consistently every night during April and May, and search for larvae every day during June at say Cannock Chase during three years, in my view the odds are if anything in favour of *ilicifolia* turning up. Another insect possibly waiting rediscovery is *Erebia ligea* Linn., (The Arran Brown). Ford (1945) discusses this species, and comes to the conclusion that it may well exist in the Scottish Highlands.

Now what chances are there of finding a new species of the second group, by separation of an existing species into two? The chances seem good to me. There is a species that may well be lying undiscovered in many collections, namely, *Cosymbia quercimontaria* (Bastel). Outwardly this insect is distinguishable with difficulty, if at all, from *C. punctaria* Linn., (The Maidens Blush), though the male genitalia of the two species are utterly different. The larva of *quercimontaria* feeds on oak, so there is no bar on this ground to the moth breeding here. In France it occurs in the West, including the Department of Seine et Oise, and is double brooded, flying in May and August. The moth also occurs in other areas, including Western Germany, Sweden and Denmark, and is single brooded in the latter, flying in June and July. In England *quercimontaria* might be single or double

brooded, so it should be sought from May to early August. The figures in this article of the male genitalia of *quercimontaria* and *punctaria* have been specially drawn by Mr. D. S. Fletcher, of the British Museum, Natural History. I am glad to have the opportunity publicly to thank him not only for drawing these figures, but also for his most valued and willing help on a number of other occasions.

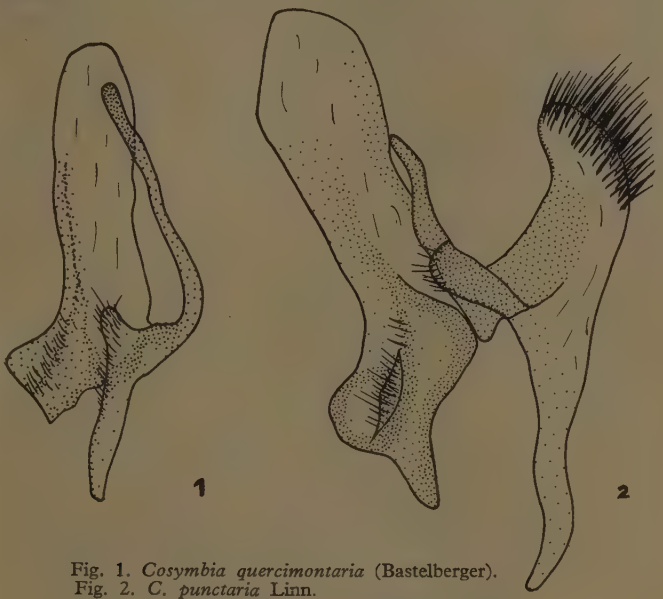

Fig. 1. *Cosymbia quercimontaria* (Bastelberger).
Fig. 2. *C. punctaria* Linn.

MALE GENITALIA. RIGHT VALVES.

There must be more than two hundred entomologists in the British Isles who will gladly travel long distances to a 'locality' for a rare species. How many of these and other entomologists will, as the result of reading this article, trouble to examine the genitalia of their *punctaria* in the hope of finding *quercimontaria*? Yet, if as the result of such an examination, *quercimontaria* were found to be breeding at, say, Ham Street, collectors by the score would rush there to take the new species. There is a moral somewhere in this, but I am not sure what it is.

The genitalia of the Cosymbia group are delicate, and need very careful handling. None the less, what an enthralling occupation for a few winter evenings it would be to examine one's *punctaria,* each time hoping to find the long threadlike organ of a male *quercimontaria*!

It may also be worth while examining one's series of *Epirrhoe tristata* Linn., (The Small Argent and Sable), to see if by some extraordinary good fortune it contains *E.pupillata* Thunb. This is a species found in the Alps in France, where it is double brooded, flying in May, July and August. It is also found in Southern Norway and Sweden, and on the west coast of Denmark, and is found eastwards into Asia. Hoffmeyer (1952) considers that in Denmark it is a relict species rather than a boreo alpine species. It is a local insect, though frequently common in very restricted localities, at any rate in Denmark. It might possibly be found in Ireland near the coast. The ground colour of *pupillata* is not so black as *tristata* and fades in set specimens to brown. The markings on the underside of *pupillata* are yellowish-brown as opposed to black in *tristata,* and there are other differences of a minor nature. The larva feeds on bedstraw, a plant widespread over the whole of the British Isles in one species or another.

It appears to be well established that a westward and northward spread of some species of Lepidoptera is in progress. It is an undoubted fact that so few of our Lepidopterists have a knowledge of Continental moths that one which resembles a common British species is likely to be overlooked for years. *Thalera fimbrialis* Scop., (The Notched Emerald), taken in 1936, was confused with *Hemithea aestivaria* Hübn., (The Common Emerald), and not distinguished for five years, (Russell 1942). This confusion is the easiest thing in the world, especially if a specimen is worn, unless one is deliberately on the alert for the differences between the two species. Certain species are known to be found in the British Isles, and it is easy for every insect taken to be treated uncritically as one or other of these known species. Of course it always is, or at least almost always—but what a triumph and excitement on the once-in-a-lifetime occasion when it is not what it seems to be. How many people have caught *fimbrialis,* or perhaps no more than seen *fimbrialis,* and freed it or ignored it in the belief that it was *aestivaria.*

This is by no means to suggest that next time you take a pale *Triphaena pronuba Linn.,* (The Large Yellow Underwing), or a dark *Agrotis segetum* Schiff., (The Turnip Moth), you should assume that it is some rare migrant from Spain or Germany. Far from it. It will be nothing more than an ordinary common or garden British *pronuba* or *segetum.* The moral though is quite plain. Study the Continental moths. Then, should you take a somewhat peculiar and rather large *Apatele psi* Linn., (The Grey Dagger), you will wonder if you have not after all taken *A. cuspis* Hübn., and your new variety of *Amphipyra pyramides* Linn., (The Copper Underwing), may be worth a further inspection to see if it is not *A. perflua* Fabr. These are no more than examples: it seems unlikely that either Continental species will be found here, although *cuspis* has reputedly been taken.

One of the most useful publications to gain some knowledge of

the near-by Continental moths is Dr. Hoffmeyer's recent work in three volumes on the Danish Macro-Lepidoptera other than Butterflies. It is of special interest because, not only is the moth population of Denmark similar to that of Britain, but a spread of insects into Denmark may be observed corresponding to, and rather earlier than that which has occurred in Britain. Thus *C. lunula* was first noted in Denmark in 1938 (England 1939, if very old and perhaps doubtful records are disregarded), and within a few years was found to have spread and become locally established, a like history followed, though more slowly, in England.

But to return: let us consider the third group, namely, the species spreading here from the Continent. Perhaps *Plusia confusa* Steph., sometimes referred to as *P. gutta* Guen., is as likely as any. It has in fact been recorded once or twice in recent years; it is spreading; it may well establish itself here much in the same manner as did *Polychrista moneta* Fabr., (The Golden Plusia) some fifty or sixty years ago. Primarily, *confusa* seems to have been a southern European species, though occurring north of the Alps in France and Southern Germany. In the 1920's it spread, though in small numbers, northwards to East Prussia, etc., and in the 1930's westwards to Holland, Denmark, Belgium, Sweden, etc., and in the 1940's to Norway. It occurs almost all over France. According to Lhomme, the moth flies in France from May to October, and the larva feeds on nettle, yarrow, wild camomile, etc.

And the fourth group, new indigenous species? Your guess is as good as mine. But I shall be surprised if two more new indigenous species are not found in the next ten years. As a suggestion, possibly a *Hydraecia* in the Scottish Highlands similar to *micacea* Hübn., (The Rosy Ear), though this strictly should perhaps be treated as of the second group, one species separated into two. And *Meganephria bimaculosa* Linn., (The Double Spot Brocade), may well be found to be breeding in England.

Now I am waiting for some grateful entomologist to lead me to the very spot where he has found *quercimontaria.*

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SOME MACROLEPIDOPTERA FROM CO. DOWN, NORTHERN IRELAND

By CAPT. W. S. WRIGHT, B.Sc., F.R.E.S.

The following List was recorded from Murlough, Dundrum, Co. Down, and is the result of eight visits in all; one in May, three in June, two in July, one in August, and one in September, during the years 1951-53. They were mostly recorded when using an 80 watt M.V. bulb and horizontal sheet.

The same position for the lights was used in each case, being amongst sandhills on a promontory of land between Newcastle Bay and Dundrum Bay. The vegetation is typically marine, sandhill association.

I wish to express my best thanks to The Marquis of Downshire for granting me permission to work here.

CO. DOWN

SPHINGIDAE

Laothoe populi (L.).	Poplar Hawk. Common.
Smerinthus ocellatus (L.).	Eyed Hawk. Common.
Deilephila porcellus (L.).	Small Elephant Hawk. Common.
D. elpenor (L.).	Large Elephant Hawk. Common.
Macroglossa stellatarum (L.).	Humming-bird Hawk. Few.

NOTODONTIDAE

Cerura vinula (L.).	Puss. Common.
Pheosia gnoma (Fabr.).	Lesser Swallow Prominent. Common.
Notodonta dromedarius (L.).	Iron Prominent. Common.
Lophopteryx capucina (L.).	Coxcomb Prominent. Common.
Phalera bucephala (L.).	Buff-tip. Common.

POLYPLOCIDAE

Habrosyne derasa (L.).	Buff-arches. Common.
Thyatira batis (L.).	Peach-blossom. Few.

LASIOCAMPIDAE

Lasiocampa quercus (L.).	Oak Eggar. Common.
Macrothylacia rubi (L.).	Fox. Common.

SATURNIIDAE

Saturnia pavonia (L.).	Emperor. Common.

ARCTIIDAE

Spilosoma lubricipeda (L.).	White Ermine. Common.
S. lutea (Hufn.).	Buff Ermine. Common.
Cycnia mendica (Clerck).	Muslin Ermine. Common.
Phragmatobia fuliginosa (L.).	Ruby Tiger. Common.
Parasemia plantaginis (L.).	Wood Tiger. Common.
Arctia caja (L.).	Garden Tiger. Common.
Hypocrita (*Callimorpha*) *jacobaeae* (L.).	Cinnabar. Common.

CARADRINIDAE

Colocasia coryli (L.).	Nut-tree Tuffet. Common.
Apatele psi (L.).	Grey Dagger. Common.
A. rumicis (L.).	Knot-grass Dagger. Common.

Agrotis segetum (Schiff.).	Turnip Dart. Few.
A. vestigialis (Hufn.).	Archer Dart. Few.
A. clavis (Hufn.).	Heart and Club. Few.
A. exclamationis (L.).	Heart and Club. Few.
A. ypsilon (Rott.).	Dark Sword Grass. Few.
Euxoa tritici (L.).	White-line Dart. Common.
Lycophotia porphyrea (Schiff.).	True Lovers' Knot. Common.
Actebia praecox (L.).	Portland Dart. Common.
Amathes agathina (Dup.).	Heath Rustic. Common.
A. glareosa (Esp.).	Autumnal Rustic. Common.
A. baja (Schiff.).	Dotted Clay. Common.
A. c-nigrum (L.).	Setaceous Hebrew Character. Common.
A. triangulum (Hufn.).	Double Square-spot. Few.
Diarsia festiva (Schiff.).	Common Ingrailed Clay. Common.
Ochropleura plecta (L.).	Flame Shoulder. Common.
Axylia putris (L.).	Flame Rustic. Common.
Triphaena comes (Hubn.).	Lesser Yellow-underwing. Common.
T. pronuba (L.).	Common Yellow-underwing. Common.
T. janthina (Schiff.).	Lesser Bordered Yellow-underwing. Common.
Ceramica pisi (L.).	Broom Brocade. Common.
Diataraxia oleracea (L.).	Bright-line Brown Eye. Common.
Hadena thalassina (Hufn.).	Pale Shouldered Brocade. Common.
H. bombycina (Hufn.).	Glaucous Shears. Few.
H. conspersa (Schiff.) (*nana*) (Rett.).	Light Shears. Few.
H. cucubali (Schiff.).	Campion Coronet. Few.
Heliophobus albicolon (Hubn.).	White Colon. Two.
Tholera popularis (Fabr.).	Feathered Gothic. Common.
Charaeas (*Cerapteryx*) *graminis* (L.).	Antler. Common.
Thalpophila matura (Hufn.).	Straw Underwing. Few.
Procus strigilis (Clerck).	Marbled Minor. Common.
P. fasciunculus (Haw.).	Middle-barred Minor. Common.
Apamea sordens (Hufn.).	Rustic Shoulder-knot. Common.
Celaena (*Apamea*) *secalis* (L.).	Common Rustic. Common.
Celaena haworthii (Curt.).	Haworth's Minor. Common.
C. leucostigma (Hubn.).	Brown Crescent. Common.
Xylophasia obscura (Hubn.).	Dusky Brocade. Common.
X. crenata (Hufn.).	Cloud-bordered Brindle. Common.
X. lithoxylea (Schiff.).	Light Arches. Common.
X. monoglypha (Hufn.).	Dark Arches. Common.
Aporophyla nigra (Haw.).	Black Rustic. Common.
Allophyes (*Meganephria*) *oxyacanthae* (L.).	Green-brindled Crescent. Few.
Euplexia lucipara (L.).	Small Angle-shades. Few.
Phlogophora meticulosa (L.).	Large Angle-shades. Common.
Hydraecia crinanensis Burr..	Crinan Ear. Common.
H. lucens Frey.	Large Ear. Common.
H. micacea (Esp.).	Rosy Rustic. Common.
Arenostola pygmina (Haw.).	Small Waiscot. Common.
Rhizedra lutosa (Hubn.).	Large Wainscot. Few.
Leucania litoralis (Curt.).	Shore Wainscot. Common.
L. pallens (L.).	Common Wainscot. Common.
L. impura (Hubn.).	Smoky Wainscot. Common.
L. lythargyria (Esp.).	Clay Wainscot. Few.
Stilbia anomala (Haw.).	Anomalous. Few.
Meristis trigrammica (Hufn.).	Treble-line. Few.
Orthosia gothica (L.).	Hebrew-character. Common.
O. stabilis (Schiff.).	Common Quaker. Common.

O. gracilis (Schiff.).	Powdered Quaker. Common.
Xylocampa areola (Esp.).	Early Grey. Common.
Xylena vetusta (Hubn.).	Red Sword-grass. Few.
Cucullia umbratica (L.).	Common Shark. Few.

PLUSIIDAE

Plusia chrysitis (L.).	Burnished Brass.
P. festucae (L.).	Gold Spot. Common.
P. iota (L.).	Plain Golden Y. Common.
P. v-aureum (Hubn.) (*pulchrina* (Haw.)).	Beautiful Golden Y. Common.
Abrostola triplasia (L.).	Dark Spectacle. Common.
Abrostola tripartita (Hufn.).	Light Spectacle. Common.

GEOMETRIDAE

Pseudoterpna pruinata (Hufn.).	Grass Emerald. Common.
Anaitis plagiata (L.).	Slender Treble-bar. Few.
Chloroclystis coronata (Hubn.).	V Pug. Common.
Semiothisa liturata (Clerck).	Tawny-barred Angle. Few.
Selenia bilunaria (Esp.).	Early Thorn. Common.
Lithinia chlorosata (Scop.).	Brown Silver-line. Common.

ZYGAENIDAE

Zygaena filipendulae (L.).	Six-spot Burnet. Common.

HEPIALIDAE

Hepialus fusconebulosus (De G.).	Map-winged Swift. Common.
H. humuli (L.).	Ghost Swift. Common.

Since submitting my MS., two additional species to this list were taken at Dundrum on the 25th June, 1954.

CARADRINIDAE

Heliothis armigera (Hueb.).	Scarce Bordered Straw. One.
Hecatera serena (Schiff.).	Broad-barred White Gothic. One.

MIGRANT PYRALIDAE (LEPIDOPTERA) IN MIDDLESEX

On the night of 19th/20th July, 1955, two specimens of *Anania nubilalis Hübn.*, (Cloudy Wormwood Pearl) came to the M/V trap in my garden here (one male, one female).

Four nights later (23rd/24th July) a female specimen of *Margaronia unionalis* Hübn., (Scarce Olive-tree Pearl) appeared in the trap.

We have Jasmine in the garden and I shall be interested to see if any progeny of this or other female *M. unionalis* appear at a later date.

E. W. Classey.

22 Harlington Road East,
Feltham, Middlesex.

THIRD SUPPLEMENT
to the
'Indexed Check-list of the British Lepidoptera, with the English Name of each of the 2,313 Species' (1947)

By I. R. P. HESLOP, M.A., F.R.E.S.

Section I

INTRODUCTORY NOTE

This Third Supplement to my 'Indexed Check-list' consists primarily of a list of the additions, nine in number, made during 1953 and 1954. This brings the total number of species to 2,369.

Corresponding augmentations to the Indices are understood in all cases. And three additions to the list of Authors are involved.

There is also a Section stating an amendment of nomenclature to a previous Supplement.

I wish to express my grateful thanks to Dr. B. P. Beirne, Mr. E. W. Classey, Mr. W. H. T. Tams, Mr. S. Wakely and the Baron de Worms for information and advice.

I. R. P. HESLOP.

'Belfield',
Burnham-on-Sea, Somerset.
4th July, 1955.

Section II

ADDITIONS (9)

(Closed 31st December, 1954)

PAPILIONES

26A	Nymphalis xanthomelas *Esp.*	Eastern Tortoiseshell

AGROTIDES

220A	Cryphia divisa *Esp.* (*raptricula* Hübn.)	Marbled Gris
308A	Graphania dives *Philpott*	Maori Gothic
522A	* Synthymia fixa *Fabr.* (*monogramma* Hübn.)	Goldwing
531A	Plusia biloba *Steph.*	Stephens's Gem

* Synthymia fixa, in Eustrotiinae.

PSYCHES

1098A	† Pompostola hypparchus *Cram.*	Belfield Burnet

TINEIDES

1555A	Recurvaria piceaella *Kearfott*	Minnion's Groundling
1929A	Coleophora clypeiferella *Hofm.*	Ridged Case

NEPTICULIDES

2237A	Nepticula lusatica *Schütze*	Silver-tipped Pigmy

† Pompostola hypparchus, in Zygaeninae.

Section III

AMENDMENT TO FIRST SUPPLEMENT

In Section II of the First Supplement under No. 534B:—

add the synonym (*gutta* Guen.)

A MELANIC SPECIMEN OF *LEUCANIA UNIPUNCTA* (HAW.), IN HANTS. (LEP.: CARADRINIDAE)

A melanic specimen of *L. unipuncta* (Haworth) (The White-speck Wainscot) came to my M.V. trap here on the night of September 28th, 1954.

JOHN R. LANGMAID.

9 Cranewater Park,
Southsea, Portsmouth,
Hants.

LUPERINA DUMERILII DUP. IN KENT (LEP. CARADRINIDAE)

Although rather late, I feel that the capture of a specimen of *L. dumerilii* (Dumeril's Luperina) in 1954 should be recorded.

I was working a Mercury Vapour light with a ground sheet on the banks of the Royal Military Canal about one mile west of Ashford, Kent. The specimen, a male, was taken at the sheet on 17th September, 1954.

A. L. GOODSON.

Zoological Museum,
Tring, Herts.

ENALLAGMA CYATHIGERUM (CHARP.) (ODONATA) PREY OF THE SPIDER *ARANEUS QUADRATUS* CLERK

Last year I pointed out (*Lond. Nat.* **33**: 3-4) that only one Spider, *Araneus cornutus* Clerk, appeared to be involved in British records of dragonflies as prey of spiders. I was interested, therefore, to receive from Mr. A. E. Gardner an immature ♀ *Araneus quadratus* Clerk, which he had found at Wisley, Surrey, on the 19th July, in the act of devouring a ♂ *Enallagma cyathigerum* (Charp.). The web, Mr. Gardner tells me, was on heather and a hundred yards from a pond.

An adult *quadratus* is a strong spider, larger than *cornutus*; constructing a similar web with, however, a shallower silken dome retreat, and it appears to spend more time at the centre of its web by day than does *cornulus*. The only reason, I think, that dragonflies do not figure (more often) as its prey is its choice of habitat. Although E. Nielsen (1932, *Biology of Spiders*, **1**: 172) found it most often in bogs and other damp places in Denmark, in this country it does appear to prefer open heath (heather and gorse) away from water.

A. E. Le Gros.

9 Victoria Avenue,
Wellington, Shropshire.

RECENT LITERATURE

Folkestone Natural History Society, 1954. Special Edition in honour of the Conference of S.E. Union of Scientific Societies. 1955. pp. 28.

This interesting publication contains two and a half pages of 'Entomological Notes' by C. A. W. Duffield. Several records are worthy of note: *Jaspidea deceptoria* Scop., was taken at Brook on 30th May, and *Agrotera nemoralis* Scop., was beaten out of Hornbeam in Ham Street Woods. More than twenty years have passed since this insect was last recorded in Britain. Of the number of specimens of *Lithomoia solidaginis* Hübn., recorded as migrant to the South of England during 1954, one is claimed for Folkestone. Probably the most interesting capture of the year was *Plusia gutta* Guenée (*confusa* Stephens), taken by Mr. Percy Cue at Ashford.

Unfortunately, it appears that the 'Entomological Notes' were never checked in page proof—and probably not even in galley. Only three times are generic names given, and in every other case the specific names are given with a capital initial letter. Typical of this and of the general low standard due to lack of proof checking are the following:—*Bellarqus* for *bellargus, Euphrosym* for *euphrosyne,* and *Chadn ia* for *chaonia.*

E.W.C.

Chambers's Journal for July, 1955, contains an interesting article, *Dawn Adventure,* by Wilfred E. Norris, concerning Butterfly-hunting in a penal colony in French Guiana. Again we have the vulgar error of the use of capital letters initially in specific names—and here it looks the more incongruous because the generic name is also given—but perhaps this is understandable in an article published in a popular journal—the wonder is that the names are spelled correctly at all, for popular journalism is not particularly given to accuracy or checking of minor facts where references are made to the biological sciences.

E.W.C.

Proceedings and Transactions of the South London Entomological and Natural History Society, 1953-54, with 15 plates, 7 text figures and 4 appendices. Published April, 1955. Price, 15s.

The extremely high standard of the publications of this society is well maintained in the present volume. It is interesting to see a return to an old practice in publishing a few photographs of members attending Field Meetings. It is often hard to come by representations of amateur entomologists of the past, and these plates will probably be of more interest in the future than at the moment. '*Some remarks on the British Heteromera*', by Mr. F. D. Buck, will be found useful by Coleopterists, and is very well illustrated by eight plates. The *President's Address,* by Mr. F. Stanley Smith, entitled *The History of the 'South London' Society,* is as able as it is fascinating.

E.W.C.

The London Naturalist, The Journal of the London Natural History Society for the year 1954 (No. 34). With 8 plates. Published June, 1955. Price, 7s. 6d.

In this volume is continued the fine local list of *The Moths of London and its Surroundings,* by C. G. M. de Worms, the first part of which appeared in the volume for 1953. The present instalment treats of the Super-family Agrotidae as far as the genus Hydraecia. *The Flies of the London Area* II. Culicidae, by Edwin R. Nye, contains a 'Key to the British species of Culex'. This Key is a most acceptable offering in view of the additions to our fauna in recent years of the species *modestus* Ficalbi and *torrentium* Martini. Mr. Nye follows the excellent practice of students of the Culicidae in keying the larvae as well as the adults. The *Survey of Bookham Common* completed thirteen years of observations with 1954, and the present volume contains a short account of the Beetles of the Gun-Pits by the late L. G. Payne, edited by C. P. Castell. There are also several other good papers devoted to entomology.

E.W.C.

Two most interesting papers by Monsieur Jean Bourgogne on 'Theoretical and Practical Considerations in the use of Light for Catching Insects' and 'Mercury Vapour Lamps' were published in *Revue Française de Lépidoptérologie (L'Amateur de Papillon)* Vol. XIV for 1953-54 pages 61-64 and 81-99. The author first discusses some general principles of light in simple language, and continues with a comparison of the several sources of light which can be used. He then discusses in a clear and easily understood manner the theory and practice of M.V. lamps so far as concerns entomology, the three types of lamp available, namely normal, Woods glass envelope and compound lamp (part M.V., part filament), and the advantages and disadvantages of each type. He also refers to two makes of portable generators available in France, and gives much useful general information on prices, precautions against ultra violet rays, etc. Most useful and instructive reading for the very amateur electrician. The author omits to mention one factor in which the normal M.V. lamp has an advantage over the other types: this is that the glass envelope keeps considerably cooler so that an ordinary M.V. lamp can be left in the open irrespective of weather with negligible risk of sudden cold rain causing the envelope to crack.

The same author on page 138 reports the capture of *Vanessa virginiensis* Drury (*huntera* Fab.), the American Painted Lady, on 6th September, 1953, at Pornichet (Loire-Inferieure) some seven or eight miles from St. Nazaire. The butterfly was caught sitting on a flower.

On pages 167-179 Monsieur H. de Lesse describes the pre-imaginal states of certain continental Erebias. Of particular interest are his notes on breeding. He says that, except for very short periods, it is not possible to rear Erebia larvae on cut grass. Growing grass is essential. Temperatures below 14 degrees Fahrenheit kill most larvae, so that in captivity it is necessary in very cold weather either to give the larvae shelter, or to cover them with snow to keep them warm. Numerous grasses have been found suitable as foodplants in captivity, *Poa protensis* L., in general being the best. M. de Lesse obtained wild larvae in April. These were in their third instar, whereas larvae of the same species bred in captivity from ova obtained from a female captured in the same locality, and hibernated near Paris, were mainly in their second instar. M. de Lesse suggests that in nature the life cycle may be two years. The method of rearing described in this article may well be suitable for the British Erebias.

On page 198 the capture of two male *Tathorhynchus exsiccata* Led., is recorded from Menton, Alpes Maritimes on 2nd and 8th April, 1952. These are apparently the sole records of the insect in France. A black and white photograph is reproduced to show the insect. R.M.M.

BOOK REVIEWS

Illustrierte Bestimmungstabellen der Wanzen, II, Europa (Hemiptera-Heteroptera Europae), Prt. 1:1-32. By Wolfgang Stichel. Published by the author, Berlin. Sole distributor in British Commonwealth, E. W. Classey.

This is the first part of a work intended to provide Keys to the whole of the European Hemiptera Heteroptera. The subscription price for the first part is 8s., the normal price will be 11s. 6d. It is intended to issue parts every 2 or 3 months, but some of these will be double parts and the frequency of issue will depend on the support obtained.

As only the first 32 pages have been issued it is not possible to say a great deal about the work.

It will be well illustrated with simple line drawings and this is a useful feature. The drawings given in this first part (Vorwort & Terminologie) are very clear, but may we express the hope that in future parts any wording appended to figures may be in printed characters and not reproduced from the hand-printed letters on the original drawings, however clear these may be?

We also feel that it is a pity that the paper size differs from that used for Stichel's *Illustrierte Bestimmungstabellen der Deutschen Wanzen* 1925-38, for many Hemipterists and librarians will want to place the two together and they are not a good match. This, of course, is a very minor matter and is no valid criticism of a work which we feel will be widely welcomed.

A.E.G.

The Wirral Peninsula, by Norman Ellison, 1955. The Regional Books Series. 264 pp., 25 black and white illustrations, 1 sketch map. Robert Hale Ltd., London. Price, 18s.

Although containing but little information on the entomology of the district, we commend this work to all who desire to know something of the history, the people and bird life of Wirral.

Lying between the broad estuaries of the Mersey and Dee, the Wirral Peninsula possesses nearly every type of habitat of interest to the entomologist except a swift-flowing freshwater river. Alas, many of the sand dunes which were classic collecting grounds of the last century have now disappeared since Golf became 'Big Business'. There are, however, many leafy lanes, heather-clad commons and an attractive coast-line which provide good collecting grounds for the entomologist.

Besides containing an interesting chapter on the bird and wild life of the Hilbre Islands, the entire book is pleasantly written by a keen naturalist who obviously knows and loves his native Peninsula.

A.E.G.

BOOK REVIEWS

Lepidoptera of the York District. A two year survey. By Raymond J. Penrose and other entomologists of the Bootham School Natural History Club. 1954. 36 duplicated pages. Illustrated. Obtainable for 1s. 3d., post free, from C. J. Smith, Bootham School, York.

A 'Local List' can mean anything or nothing, a mere list of names without data of any sort often does duty. The York district has been unusually fortunate in its lists, both in quantity and quality, and Bootham School itself had already contributed its quota before the appearance of the present account.

The modesty of presentation and appearance belies the importance and excellence of this survey; it should certainly be *printed* in a second edition if Bootham School can find funds for the purpose. It is evident that the credit for the work is mainly due to a young man, Raymond Penrose, who left the school in 1954. In the introduction collecting methods are discussed, and it is obvious from the discussion that the Robinson theories of *dazzle* and *unbalance* are thoroughly understood (which is not general among even adult collectors). Lists follow of all species recorded (including Microlepidoptera) giving English and Scientific names and stating dates of appearance, abundance and localities. Next follows a dissertation on *Factors affecting Moth Trapping,* with graphs showing relationship of total numbers of specimens and numbers of species taken, to temperature, humidity, rain, wind and moon phases.

There is a section on the relative captures of different Families of Lepidoptera at Mercury Vapour Light with two very interesting illustrations.

Various other aspects are discussed and illustrated, and it is impossible to do justice to the work without reproducing it in full!

This small and unassuming production could with advantage be taken as a yardstick for all Local Lists, and certainly one could not find better value for money anywhere—in short, buy a copy—you will be delighted with it.

E.W.C.

Raupenkalender für das Mitteleuropäische Faunengebiet Nach den Futterflanzen geordnet, by Paul Blasche. 8vo. pp. 149. Cloth bound. Stuttgart. Alfred Kernen Verlag. 1955. Price in G.B., 17s. 6d.

To the active field lepidopterist in Great Britain this should prove to be an invaluable little book. If used in conjunction with *Larval Foodplants* by P. B. M. Allan (1949) a useful and complete guide will be provided for just about all species which are, or are likely to be, found in this country.

The present work lists the Macrolepidoptera under the plants on which they feed, with a column showing the months in which they

are to be found; another column is provided for 'remarks', some of which are very useful. Following this is a list of insects with the vernacular German equivalents. There is also an alphabetical specific index and this is one of the most important features.

It would have been possible to make the cross-references easier and more complete (as an example one could quote *The Entomologist's Log-book* by A. G. Scorer, 1913) but this would have made for a very much larger book and, in consequence, a very much higher price. In this sense we consider that a happy medium has been struck between utility and economy.

In these days when species are being added to the British List at a rate greater than we have known for upwards of a century, and when species which have been considered as scarce migrants or casual vagrants are being found to be established and breeding, it is useful to have at hand some reference book which will help us with knowledge of the foodplants and times of appearance of larvae. When such a book is both available and inexpensive it should prove popular and we are convinced that this will be the case with the present volume.

E.W.C.

Terricole Dipterenlarven, by A. Brauns (Göttingen, 1955). 8vo. Pp. 179, 3 col. pl. Cloth. Price in G.B., £1 18s.

Literature available on the larvae—and indeed on the detailed biology—of many families of Diptera is very fragmentary. This new book dealing specifically with the various groups of dipterous larvae encountered in the surface layers of the ground is based on 1,800 ground samples in differing localities, followed by the study of the 5,400 larvae collected; it makes no claim to be complete but does provide a great deal of valuable information, which is well presented and will be of extreme interest to every practical field worker on the Diptera.

The book starts with a larval key to family level and this is followed by a more detailed discussion of the ecology and characteristics of the larvae in the families treated, with further keys to genera and in some cases to species. A further chapter deals with the special biological problems affecting ground-living larvae. There are about 100 excellent drawings of larvae illustrating the morphological characters used in the keys.

A second volume in which the pupae of ground-living larvae will be studied from a similar angle is in preparation.

K.A.S.

Handbooks for the Identification of British Insects Vol. X Part 4(a). Diptera Cyclorrhapha—Calyptrata (1). Tachinidae and Calliphoridae. By F. I. van Emden. Price 20s.

This is a further excellent addition to the Handbooks published by the Royal Entomological Society; it should stimulate further study of

the Tachinidae and Calliphoridae by amateurs, who now have available an accurate guide to these families. Much useful work remains to be done, however, in the way of working out complete host lists.

An interesting improvement in this work over the earlier studies of the Tachinidae by Wainwright and Day is that an attempt has been made to produce keys based on 'essentially natural groups', as opposed to the 'easy' or 'artificial' keys of the earlier workers.

One minor criticism is that the economy in spacing the figures—which are individually excellent—has resulted in some lack of clarity owing to excessive congestion. K.A.S.

Studies on the Biology and Population Dynamics of British Grasshoppers, by O. W. Richards, M.A., D.Sc., and N. Waloff, Ph.D., 1954, p. 182, 4 plates, 59 figures. Anti-locust Bulletin 17, London. Price 32s. 6d.

The main subject of this paper is a study of the populations of five common British Acrididae carried out at Silwood Park, Sunninghill, Berkshire, over a period of five years.

Results indicate that food plays a very small part in determining habitats, only rarely, as in large areas of heather, are physically suitable areas lacking in sufficient food supply. The egg-pods of the British Acrididae are figured and a key to their identification provided.

Their life histories are described, it being found that all the British species have four instars before the adult (excluding the pronymph or 'vermiform larva'). An additional instar resembling the 2nd may rarely be interpolated between the II-nd and III-rd stages in *Chorthippus parallelus* (Zett.). A key is included to nymphal instars and for the separation of species up to, and including the 4th instar. The main colour patterns of the nymphs are discussed, the descriptions being based on the scheme devised by Clark (1943), this in addition to a chapter on the colour variation of adults based on the examination of thousands of specimens.

Chapters are devoted to sexual maturation, fecundity in captivity and in the field, oviposition sites, and the hatching of eggs. Sex ratios in nymphs and adults, the number and duration of nymphal instars, population estimates by means of quadrats, the study of populations by marking and recapture and small scale movements of grasshopper populations are all fully discussed. Other aspects considered include, parasites and predators, climatic factors which effect the mortality of nymphs, eggs and song. A discussion on population changes at Silwood Park, from 1947 to 1951 is followed by a comprehensive list of references.

All aspects are clearly dealt with, the techniques employed are discussed and ample statistics are included. Excellently produced and clearly illustrated, the authors and all concerned with the publication of this work are to be congratulated on producing a book of the

greatest value to all interested in the Acrididae. As a result of the detailed and painstaking research carried out by the authors, the British grasshoppers have literally overnight been raised from obscurity to some of the best known British insects.

A.E.G.

A Revised Key to the Adults of the British Species of EPHEMEROPTERA, by D. E. Kimmins, 1954. 71 pp., 30 (many compound) figures. Freshwater Biological Association Scientific Publication No. 15. Obtainable from The Librarian, The Ferry House, Ambleside, Westmorland. Price to non-members 3s.

This work replaces Mr. Kimmins' 1942 Key, a number of additions and corrections are embodied including the recently discovered *Caenis robusta* Ebn., which was taken by Dr. T. T. Macan in E. Norfolk. The key to the families and genera of larvae have been omitted as a complete key down to specific level is in preparation and will be published separately.

The introductory chapter deals with external structure, wing venation and the life-history. The nomenclature and check-list have been revised and brought up to date, the list now standing at forty-eight species. Although only just over two pages are devoted to collecting and preserving specimens, the subject is adequately dealt with and many valuable hints are given. Sixty names given by anglers to their flies are listed, together with the species of Ephemeroptera they are intended to represent.

The Keys to families, genera and species (both imagines and subimagines) are clear and supported by excellent and well produced illustrations. There are notes on ecology and finally an index to the families and genera in the keys.

Both the author and publishers are to be congratulated on this excellent little book which will prove of the greatest assistance to both entomologists and anglers.

A.E.G.

Biology of Deserts. Edited by J. L. Cloudsley-Thompson. 1954. Pages iv+224, 37 figures. Institute of Biology, London. Price 14s.

This volume contains twenty-eight papers (six in French) read at the Conference on 'The Biology and Productivity of Hot and Cold Deserts' organized by the Institute of Biology, and held at the Royal Institution during September, 1952. The six sessions devoted to various aspects of desert biology include—Climate and Physical Environment; Plant Ecology; Entomology and Ecology; Economic Aspects and Mammalian Physiology and Ecology.

Of direct interest to entomologists are the papers by Dr. B. P. Uvarov, 'The desert locust and its environment', Professor P. E. L. Vayssière, 'Les relations entre les zones désertiques et la pullulation des parasites des plantes', Dr. A. S. Balachowsky, 'Sur l'origine et le développment des insectes nuisibles aux plantes cultivés dans les oasis du Sahara francais', and Professor F. Bernard, 'Role des insectes

sociaux dans les terrains du Sahara'. Dr. C. B. Williams re-presents his interesting work '*Some bioclimatic observations in the Egyptian desert*'.

Attractively produced and illustrated, this book contains a wealth of information to entomologists working on the biology and ecology of desert species. A.E.G.

Forest entomology in Hawaii, by Dr. Otto H. Swezey, 1954. Bernice P. Bishop Museum Special Publication 44. Pp. 266, 31 figures (many compound). Published in collaboration with: The Hawaiian Botanical Society and The Hawaiian Entomological Society. Price £1 10s.

This comprehensive work dealing with the insects associated with the native Hawaiian flora will be of the greatest interest and assistance to entomologists interested in the unique flora and fauna of Hawaii. Dr. Swezey has made a lifelong study of the forest entomology and his detailed notes accumulated over a period of more than forty years covers the subject thoroughly.

It is interesting to learn that the endemic insect life in the natural, undisturbed forest, in the main, is not detrimental to the welfare of the trees. A natural balance is maintained so that there is seldom any devastating effect.

The botanical genera are arranged in alphabetical order and in the majority of species the Hawaiian name of the plant is given. After each, there follows a list of the insects associated with the plant in question together with notes on their habits and life-histories. So thoroughly does the author deal with his subject that he includes even the *Megalagrion* species (Odonata) whose larvae live in the moist habitat provided at the base of *Astelia* leaves and *M. oahuense* (Blackburn), the larvae of which are found in the debris of rotten fern fronds, etc., on moist ground beneath a heavy growth of *Gleichenia*.

The line illustrations are excellent, some of the half-tone figures, however, have suffered by being so reduced that much detail is lost. Fig. 28, p. 157, showing the pupa of the Kamehameha butterfly (*Vanessa tameamea* Esch.) illustrates the subject projecting horizontally from the leaf, this apparently merely because the shape of the illustration fits in more conveniently from the printer's point of view.

Insects that are specifically attached to a hostplant are indicated, a comprehensive list of references and an index conclude this most excellent publication which will most certainly become a permanent reference work. A.E.G.

The Entomology of Spurn Peninsula (S.E. Yorkshire), by Members of the Entomological Section of the Yorkshire Naturalists' Union, 1955. (Reprinted from '*The Naturalist*' 1951-54). 96 pp., 1 map, 3 text figs. A. Brown and Sons, Ltd., London and Hull. Sole Agent, E. W. Classey. Price, 7s. 6d.

Although the area studied amounts to less than a square mile and

in spite of the fact that the district is almost bare of trees, a close investigation has revealed a wide range of environmental conditions—sand dune habitats, a Phragmites area, a salt marsh and inland water habitats of varying degrees of salinity. The foreshore has a characteristic fauna and there are cultivated fields adjacent to the Warren. It is estimated that between a fifth and a quarter of the British fauna could be found within the area studied; this certainly is not an exaggerated estimate when the richness of the fauna is considered.

The Introduction is written by Dr. W. D. Hincks, who also contributes interesting and informative chapters on 'General entomology of the areas', 'Orthopteroid' and 'Neuropteroid' Orders, 'Hemiptera', 'Coleoptera, excluding Carabidae and Staphylinidae', 'Hymenoptera, excluding Aculeata', and 'Diptera'. G. H. Ainsworth contributes 'A short introduction to the ecology of Spurn'; P. M. Butler, 'Notes on the general Zoology of Spurn' and 'Other Invertebrates and Vertebrates, excluding Birds'. The Lepidopterous fauna consisting of 360 species has been compiled by H. N. Michaelis. It is interesting to note that in 1953 a M.V. lamp enabled many additional common and interesting species to be recorded.

S. Shaw compiled the lists of 'Hymenoptera Aculeata', 'Siphonaptera and Anoplura' and 'Coleoptera, Carabidae'. The latter number 96 species, including *Panageus bipustulatus* (F.) taken on the Warren, thus establishing an old record. A single specimen of *Agonum gracilipes* (Duft) was recorded from the south end of the Warren, but a thorough search failed to reveal *Nebria livida* (L.) which had in the past been recorded from Spurn. W. O. Steel has dealt with the Staphylinidae of which 200 species are recorded.

H. Inglescent contributes a short note on the Nosema disease of bees, G. E. Woodroffe a supplementary list of the Hemiptera-Heteroptera, A. C. Braham and J. H. Murgatroyd compiled the list of Arachnida. P. M. Butler and E. J. Popham discuss the insect fauna following the flooding in 1953. It was found that the flooding with salt water reduced the number of species of insects and other invertebrates, but a number of crustacea, molluscs and the Flounder were introduced.

Many entomologists will be conversant with this work as published in serial form in 'The Naturalist'; now with the nine parts correlated in book form it constitutes an authoritative and comprehensive list of the species to be found in the classical locality of Spurn. Unlike many 'Local Lists', a wealth of information is made available regarding the species recorded. Dates of capture, localities, types of habitat and other relative notes are supplied. Several new genera and species (some new to science) are added to the British List for the Hymenoptera.

A.E.G.

ENTOMOLOGIST'S GAZETTE

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